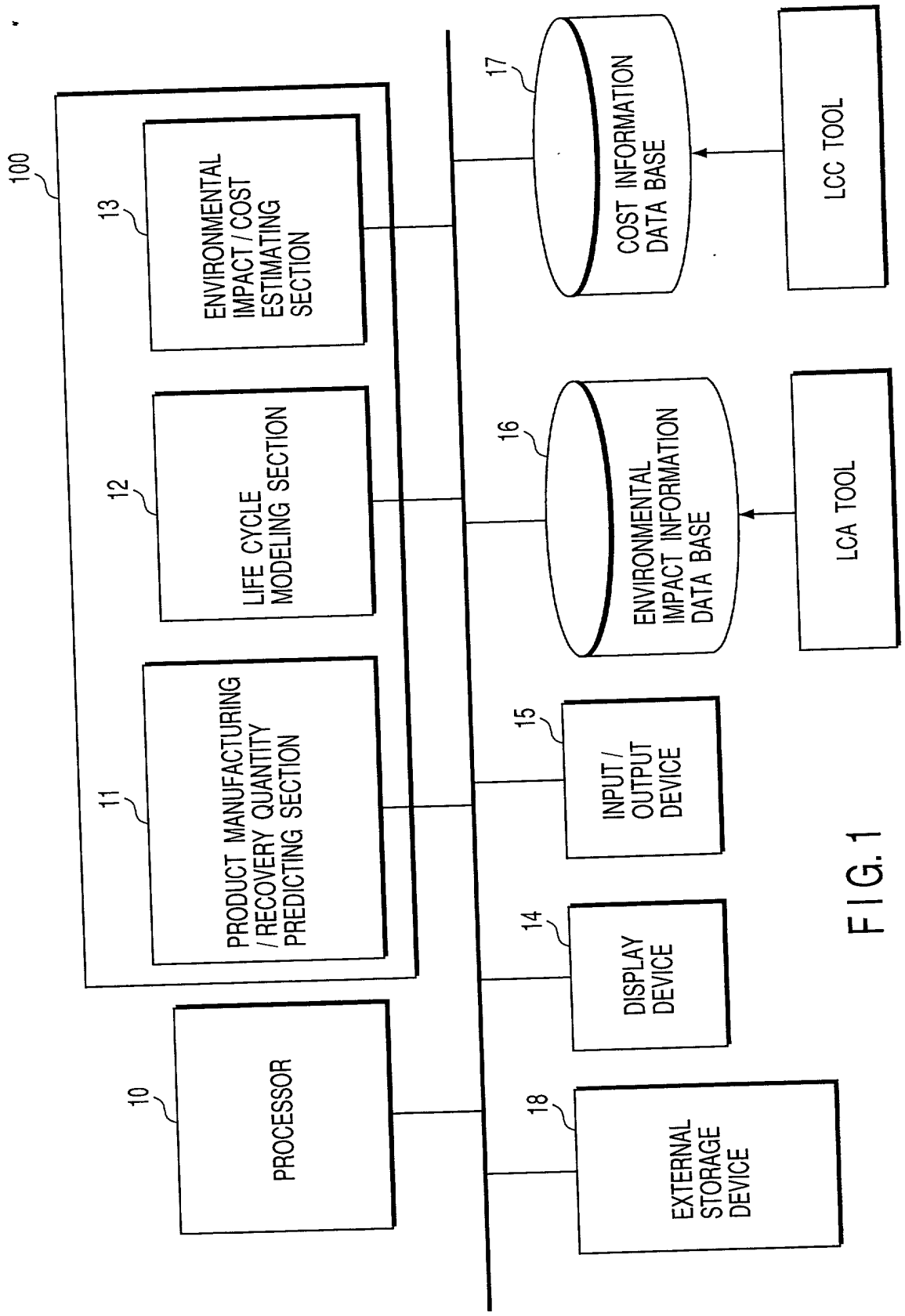
100
PROCESSOR
10
PRODUCT MANUFACTURING / RECOVERY QUANTITY PREDICTING SECTION
11
LIFE CYCLE MODELING SECTION
12
ENVIRONMENTAL IMPACT / COST ESTIMATING SECTION
13
DISPLAY DEVICE
14
INPUT / OUTPUT DEVICE
15
ENVIRONMENTAL IMPACT INFORMATION DATA BASE
16
COST INFORMATION DATA BASE
17
EXTERNAL STORAGE DEVICE
18
LCA TOOL
LCC TOOL

FIG. 1

T06290"tz8E6860

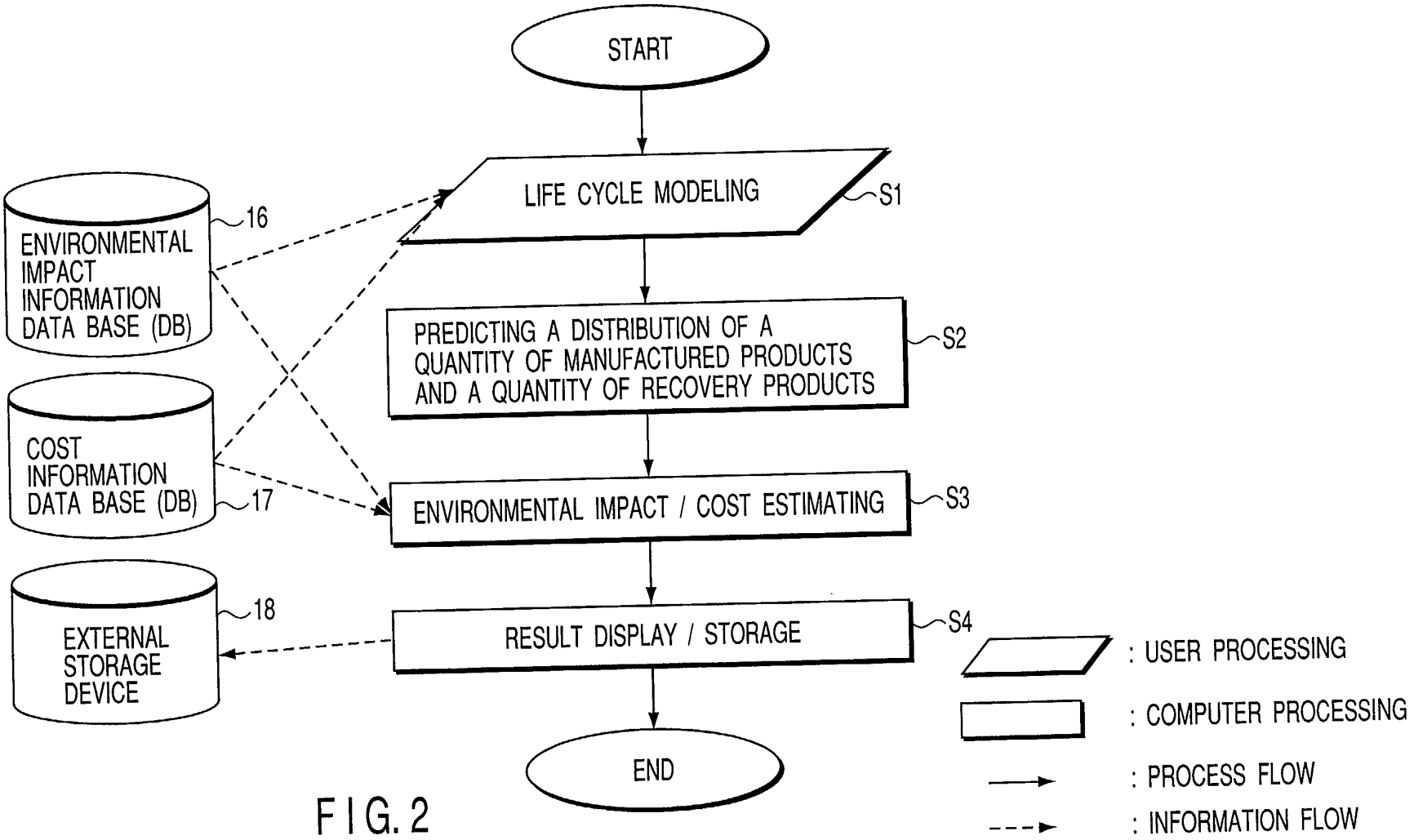

FIG. 2

OBLON, SPIVAK, ET AL
DOCKET #: 210679US2SRD
INV: Hideki KOBAYASHI, et al.
SHEET 2 OF 30

T06290 "h28E6860

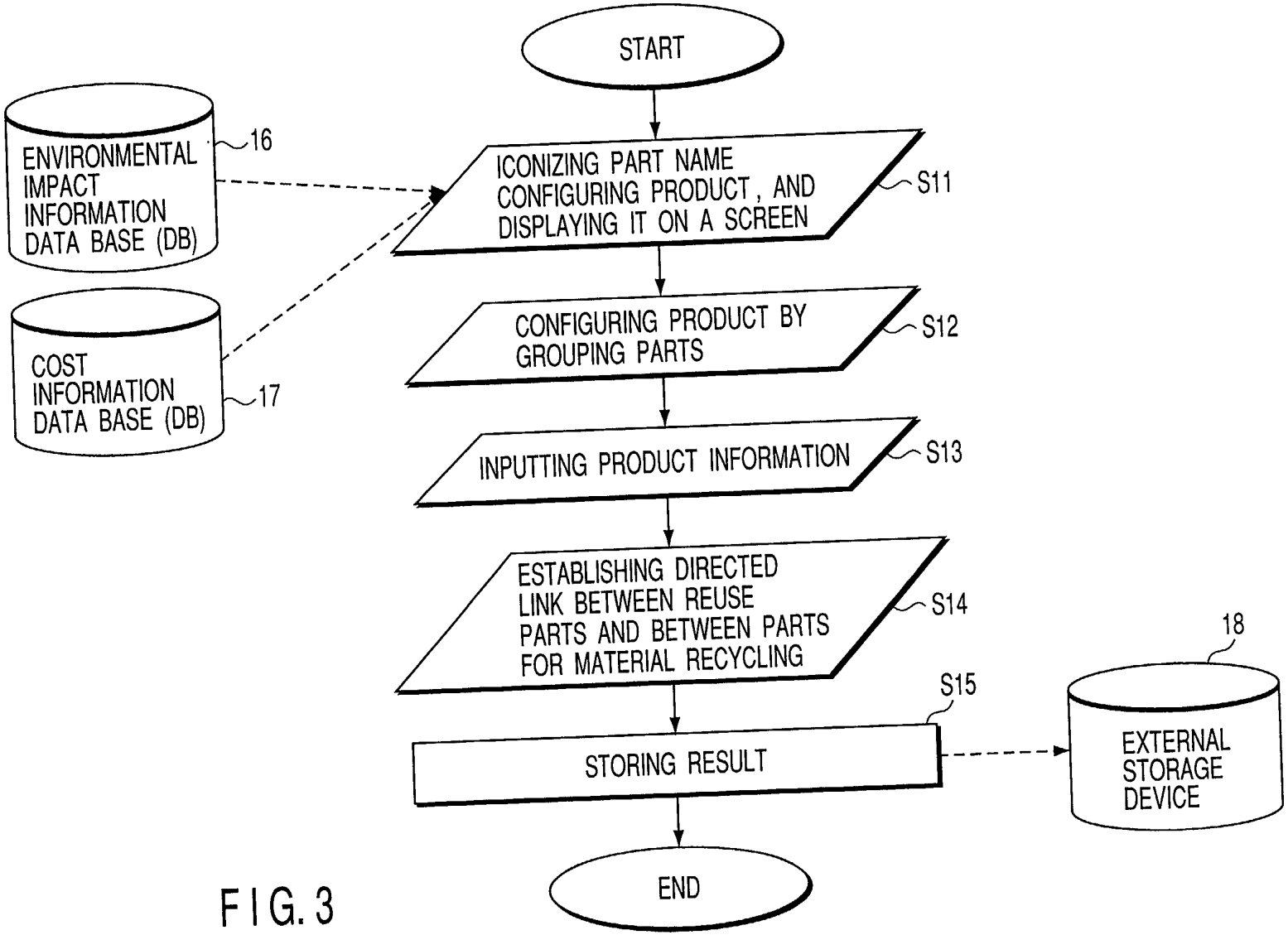

FIG. 3

OBLON, SPIVAK, ET AL
DOCKET #: 210679US2SRD
INV: Hideki KOBAYASHI, et al.
SHEET 3 OF 30

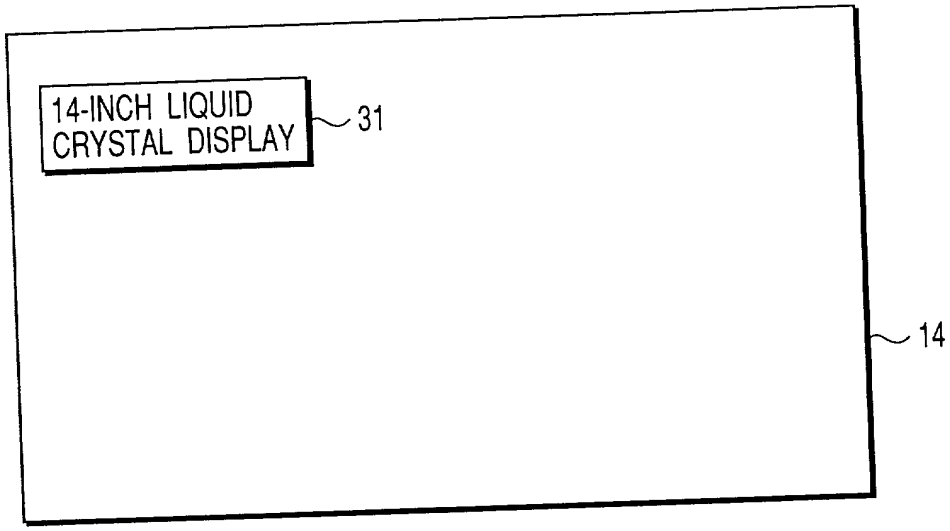

FIG. 4A

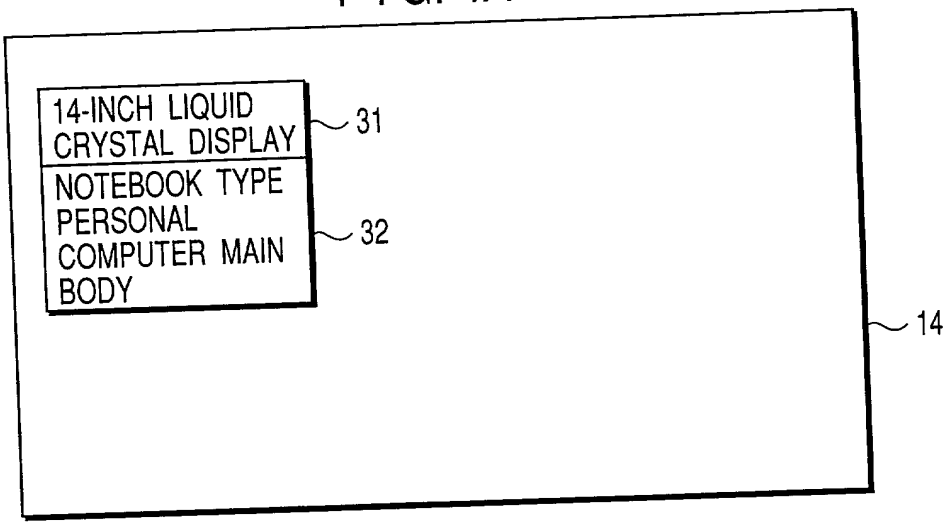

FIG. 4B

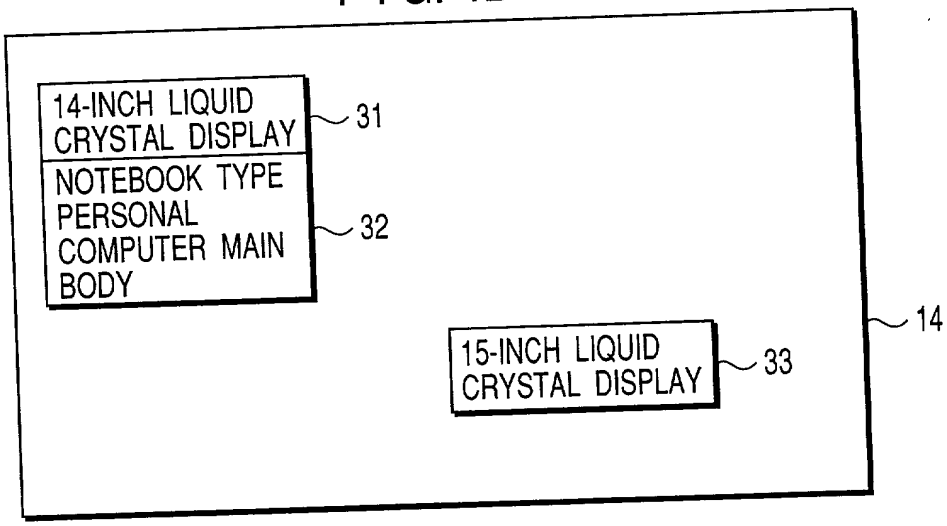

FIG. 5A

JP2003-140765

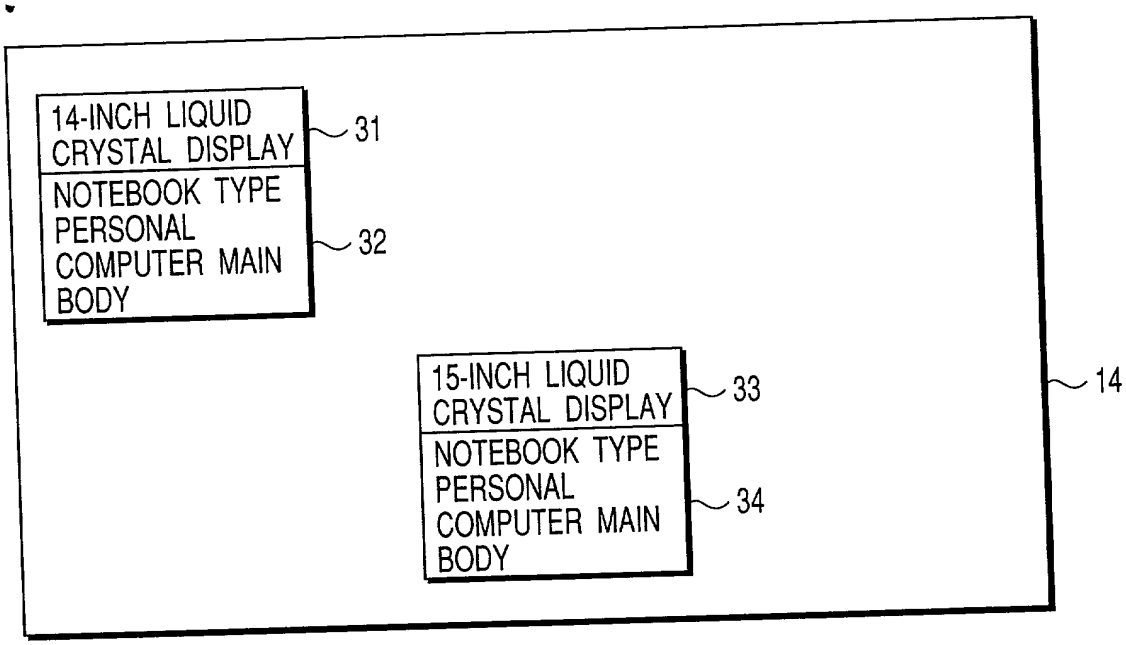
14-INCH LIQUID CRYSTAL DISPLAY
31
NOTEBOOK TYPE PERSONAL COMPUTER MAIN BODY
32
15-INCH LIQUID CRYSTAL DISPLAY
33
NOTEBOOK TYPE PERSONAL COMPUTER MAIN BODY
34
14

FIG. 5B

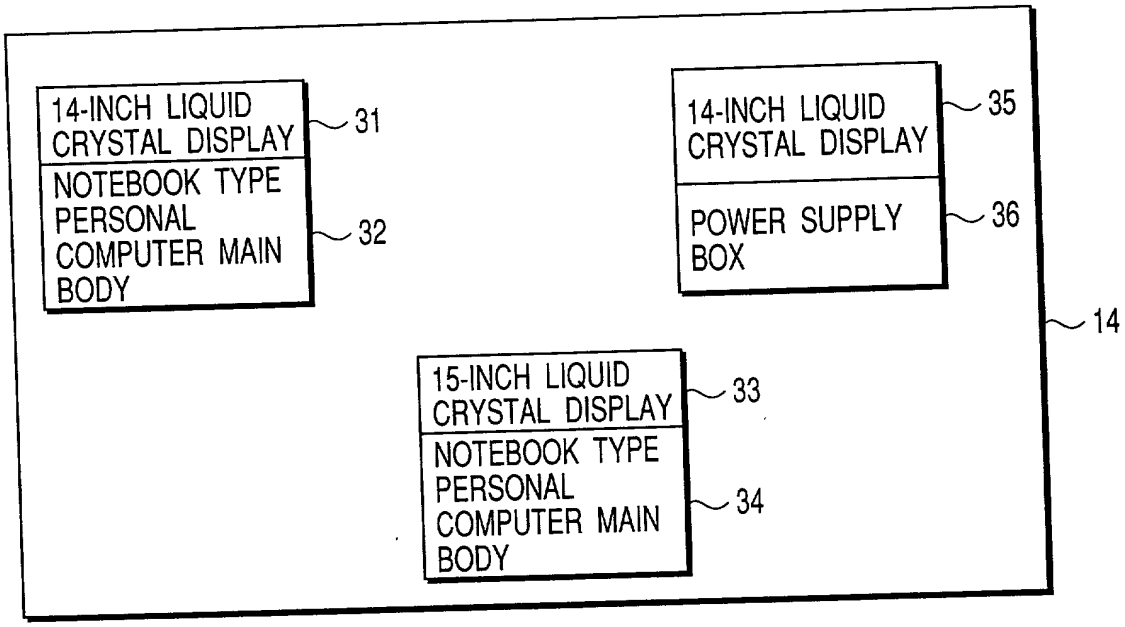
14-INCH LIQUID CRYSTAL DISPLAY
31
NOTEBOOK TYPE PERSONAL COMPUTER MAIN BODY
32
14-INCH LIQUID CRYSTAL DISPLAY
35
POWER SUPPLY BOX
36
15-INCH LIQUID CRYSTAL DISPLAY
33
NOTEBOOK TYPE PERSONAL COMPUTER MAIN BODY
34
14

FIG. 6

T06290 "h28E6860

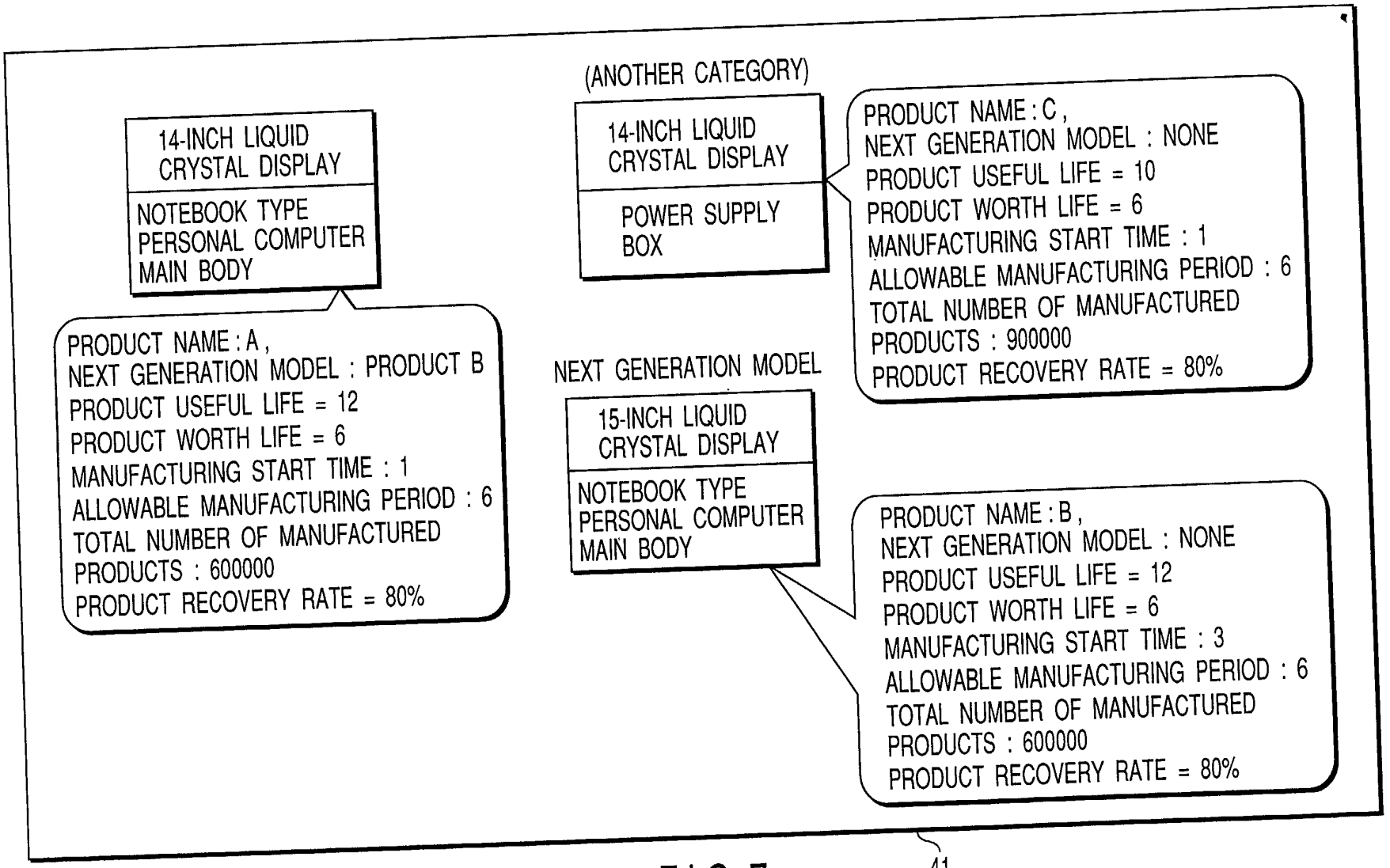

FIG. 7

OBLON, SPIVAK, ET AL
DOCKET #: 210679US2SRD
INV: Hideki KOBAYASHI, et al.
SHEET 6 OF 30

T06290"th2866960

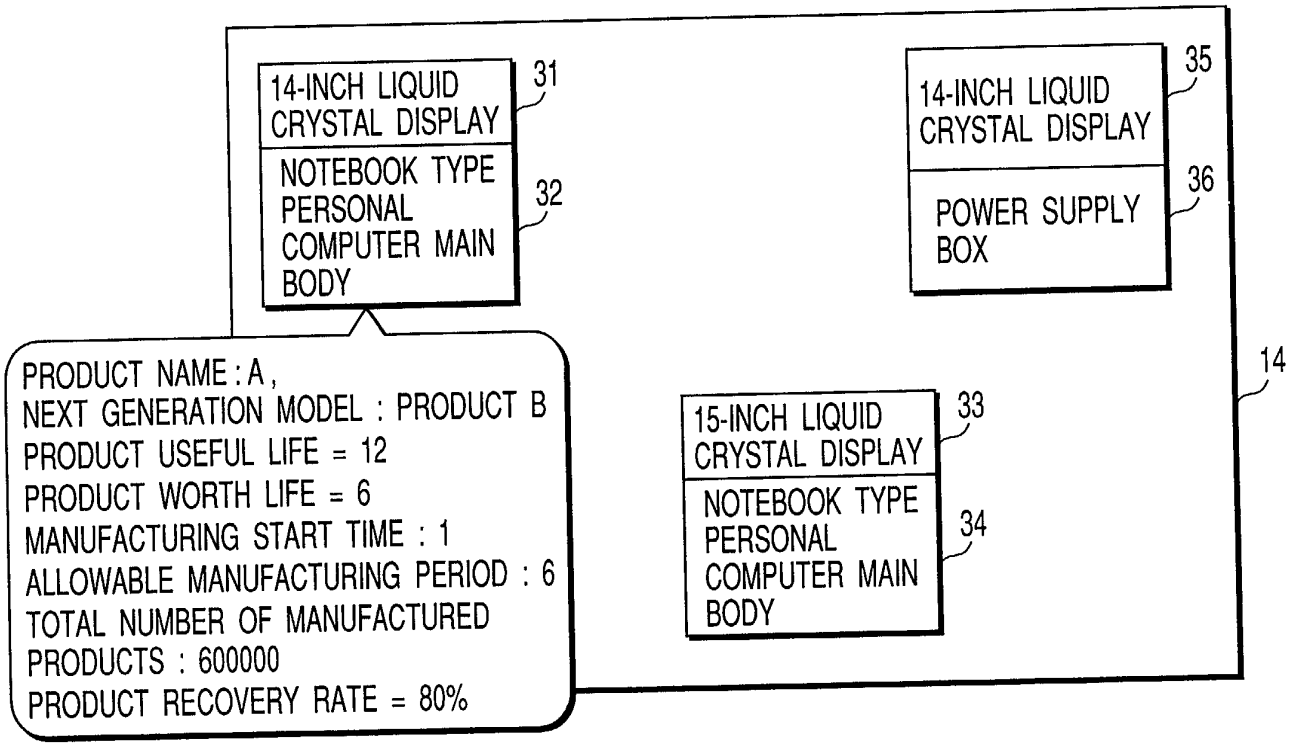

FIG. 8A

OBLON, SPIVAK, ET AL
DOCKET #: 210679US2SRD
INV: Hideki KOBAYASHI, et al.
SHEET 7 OF 30

T06290 "h28E6960

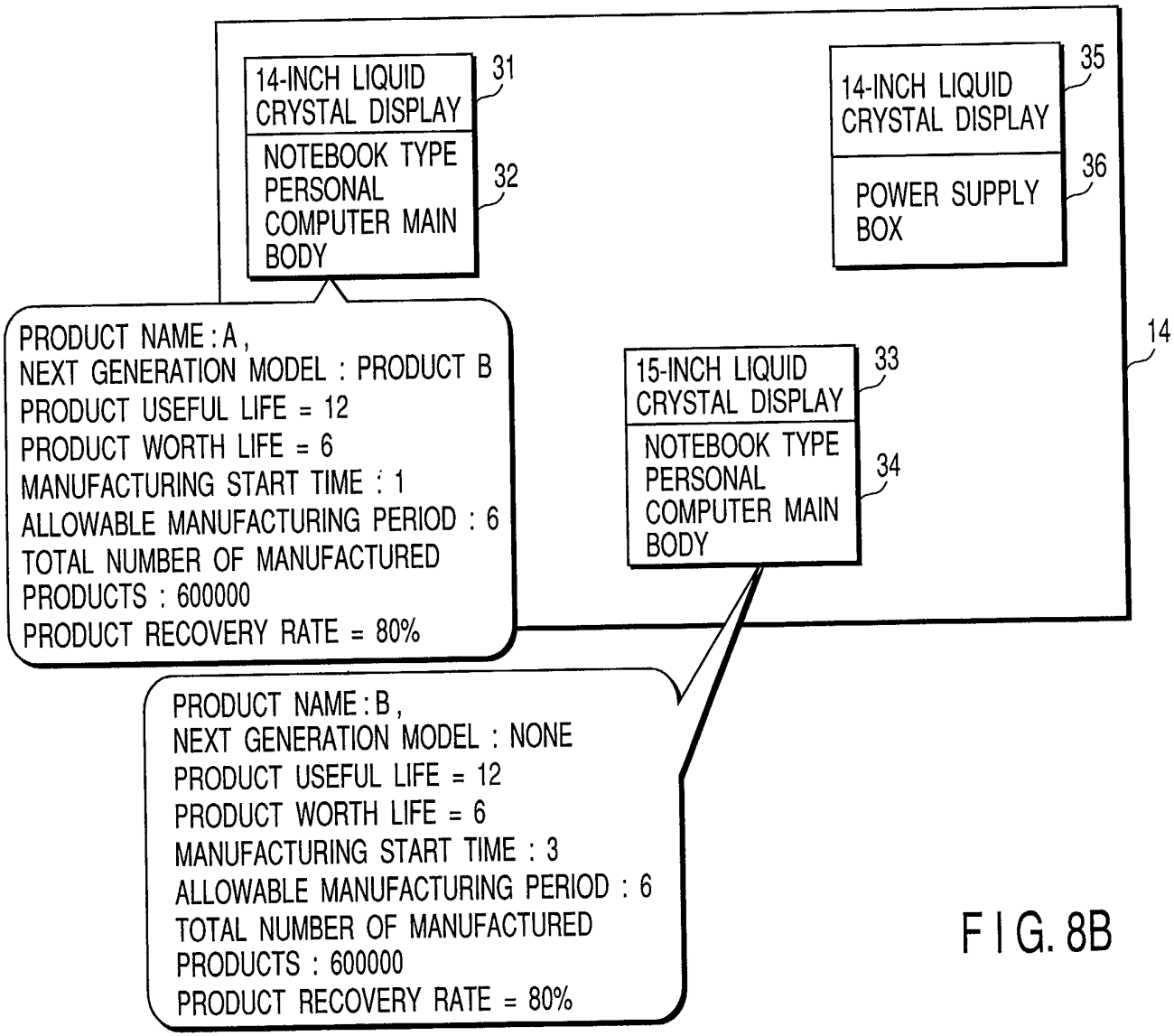

FIG. 8B

OBLON, SPIVAK, ET AL
DOCKET #: 210679US2SRD
INV: Hideki KOBAYASHI, et al.
SHEET 8 OF 30

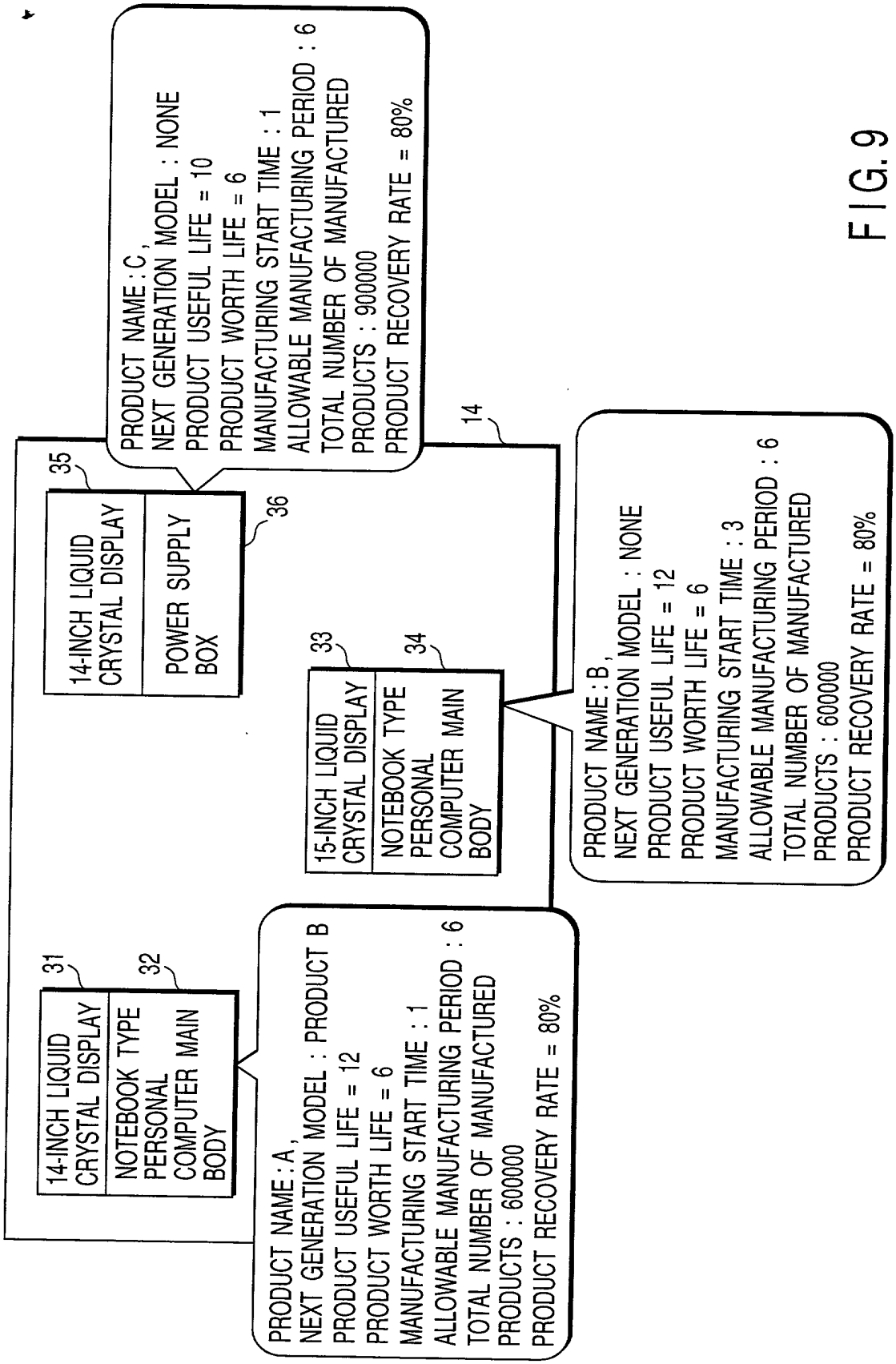
14-INCH LIQUID CRYSTAL DISPLAY
NOTEBOOK TYPE PERSONAL COMPUTER MAIN BODY
31
32
PRODUCT NAME : A,
NEXT GENERATION MODEL : PRODUCT B
PRODUCT USEFUL LIFE = 12
PRODUCT WORTH LIFE = 6
MANUFACTURING START TIME : 1
ALLOWABLE MANUFACTURING PERIOD : 6
TOTAL NUMBER OF MANUFACTURED
PRODUCTS : 600000
PRODUCT RECOVERY RATE = 80%
14-INCH LIQUID CRYSTAL DISPLAY
POWER SUPPLY BOX
35
36
PRODUCT NAME : C,
NEXT GENERATION MODEL : NONE
PRODUCT USEFUL LIFE = 10
PRODUCT WORTH LIFE = 6
MANUFACTURING START TIME : 1
ALLOWABLE MANUFACTURING PERIOD : 6
TOTAL NUMBER OF MANUFACTURED
PRODUCTS : 900000
PRODUCT RECOVERY RATE = 80%
15-INCH LIQUID CRYSTAL DISPLAY
NOTEBOOK TYPE PERSONAL COMPUTER MAIN BODY
33
34
14
PRODUCT NAME : B,
NEXT GENERATION MODEL : NONE
PRODUCT USEFUL LIFE = 12
PRODUCT WORTH LIFE = 6
MANUFACTURING START TIME : 3
ALLOWABLE MANUFACTURING PERIOD : 6
TOTAL NUMBER OF MANUFACTURED
PRODUCTS : 600000
PRODUCT RECOVERY RATE = 80%

FIG. 9

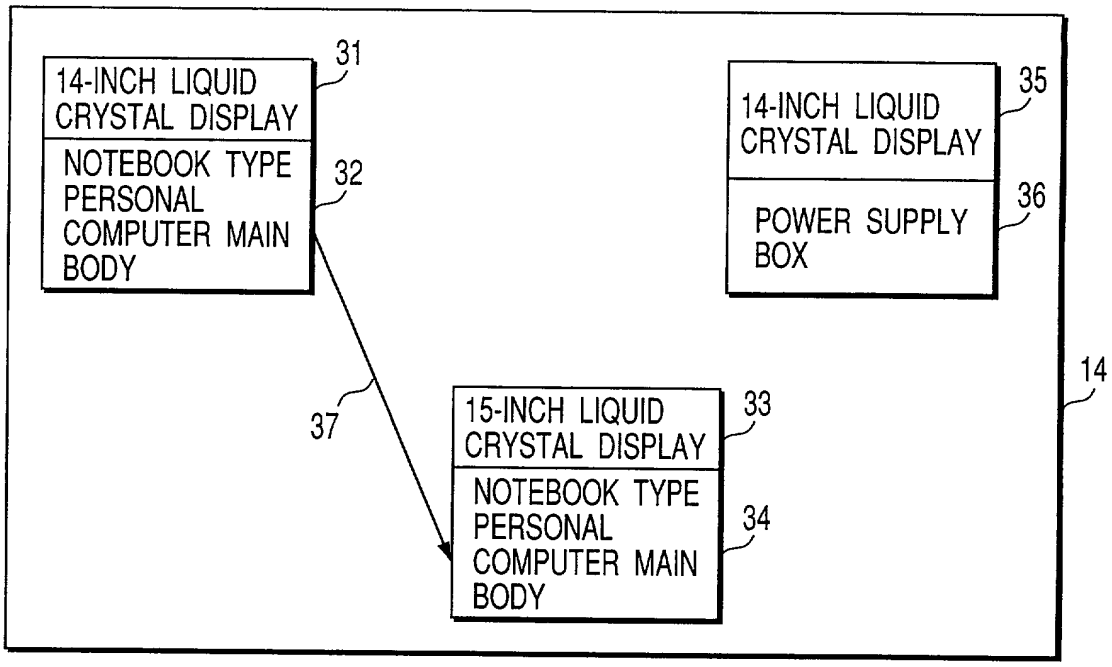

FIG. 10A

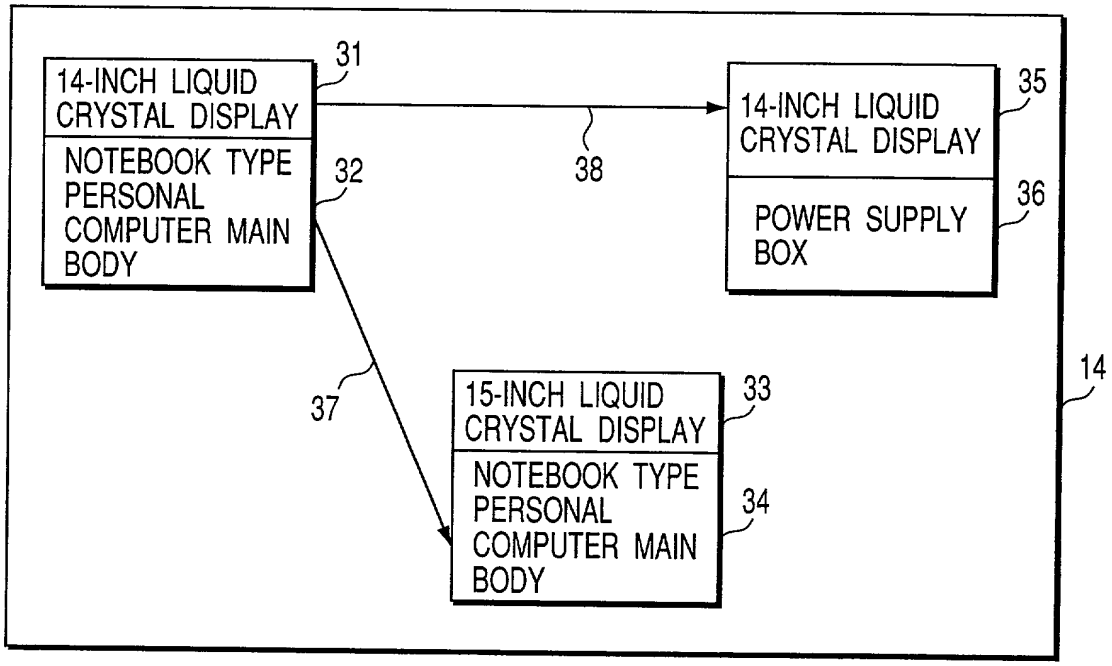

FIG. 10B

T06290"th2866860

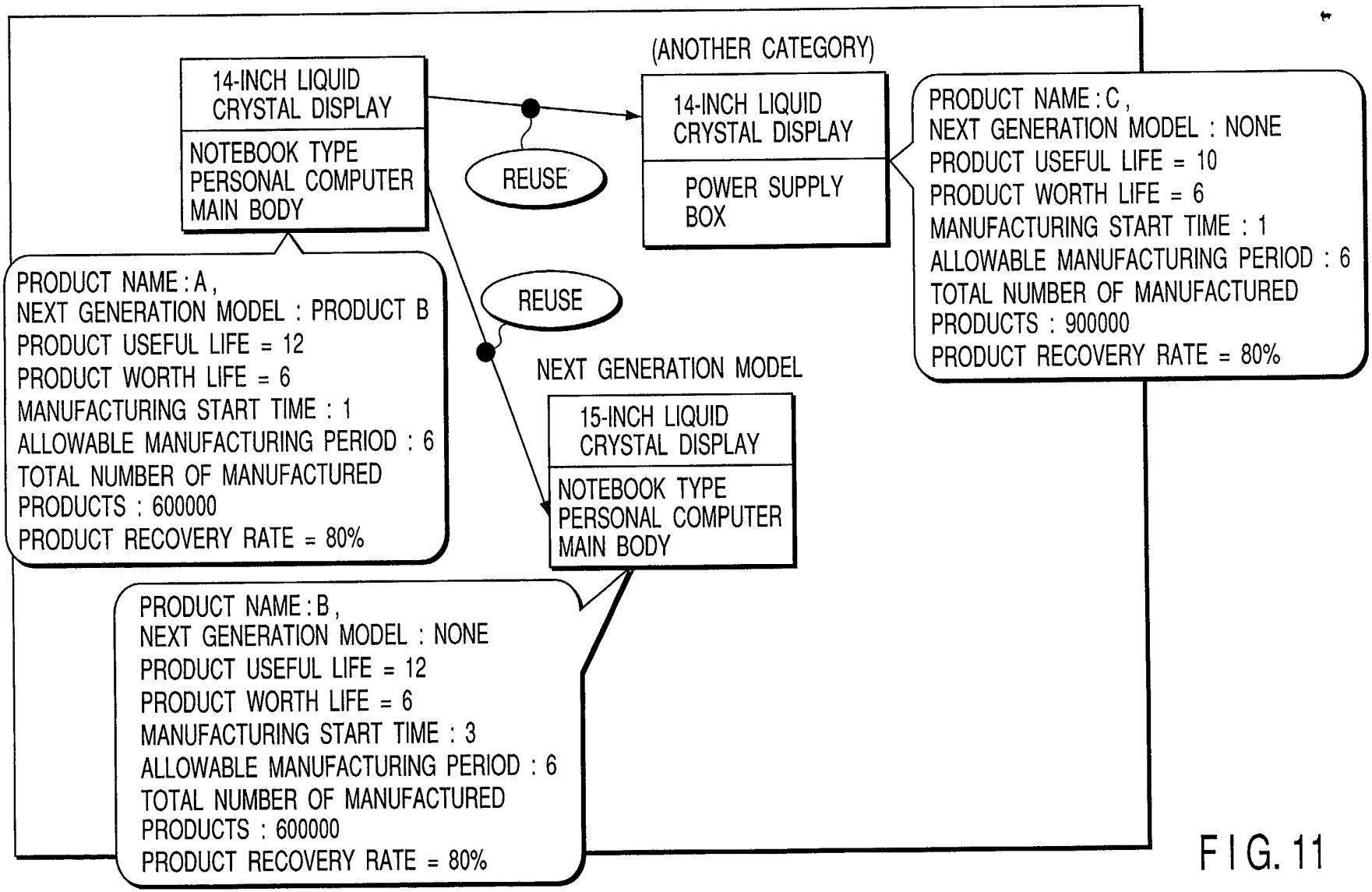

FIG. 11

OBLON, SPIVAK, ET AL
DOCKET #: 210679US2SRD
INV: Hideki KOBAYASHI, et al.
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PRODUCT DATA

PRODUCT NUMBER i	PRODUCT NAME	NEXT GENERATION MODEL NUMBER	USEFUL LIFE la(i)	WORTH LIFE lr(i)	MANUFACTURING START TIME	ALLOWABLE MANUFACTURING PERIOD	TOTAL NUMBER OF MANUFACTURED PRODUCTS P(i)	PRODUCT RECOVERY RATE C(i)
1	A	2	12	6	1	6	600000	0.8
2	B	-	12	6	3	6	600000	0.8
3	C	-	10	6	1	6	900000	0.8

PART USE QUANTITY DATA

		PART NUMBER m			
		1	2	3	4
PRODUCT NUMBER i	1	1	1	0	0
	2	0	1	1	0
	3	1	0	0	1

PART DATA

PART NUMBER m	PART NAME	WEIGHT (g)	MATERIAL ACQUISITION CO_2 (g)	PART COST (YEN)	RECOVERY / INSPECTION CO_2 (g)	RECOVERY / INSPECTION COST (YEN)
1	14-INCH LCD	800	3500	20000	100	500
2	NOTEBOOK TYPE PC MAIN BODY	1200	65300	90000	160	800
3	15-INCH LCD	900	3600	40000	100	500
4	POWER SUPPLY BOX	1000	21000	25000	80	400

THESE ITEMS OF DATA ARE SELECTIVELY READ FROM ENVIRONMENTAL IMPACT INFORMATION DATA BASE (DB) AND COST INFORMATION DATA BASE (DB)

FIG. 12A

OBLON, SPIVAK, ET AL
DOCKET #: 210679US2SRD
INV: Hideki KOBAYASHI, et al.
SHEET 12 OF 30

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REUSE PART DATA

NUMBER j OF PARTS TARGETED FOR REUSE	REUSE SOURCE MANUFACTURING NUMBER i	REUSE DESTINATION MANUFACTURING NUMBER i
1	1	3
2	1	2

PART NUMBER m	NUMBER j OF PARTS TARGETED PARTS
1	1
2	2
3	-
4	-

COMMON DATA

CO_2 PRODUCED PER PRODUCT MANUFACTURE (g)	COST PER PRODUCT (YEN)
3200	200

CO_2 PRODUCED PER PRODUCT DISTRIBUTION (g)	COST PER PRODUCT (YEN)
15	2000

CO_2 PRODUCED PER YEAR (g)	COST PER YEAR (YEN)
850	3000

CO_2 PRODUCED PER UNIT WEIGHT RECOVERY (g)	COST PER UNIT WEIGHT
0.1	1

CO_2 PRODUCED PER UNIT WEIGHT DISCARDING (g)	COST PER UNIT WEIGHT
0.8	0.5

THESE ITEMS OF DATA ARE SELECTIVELY READ FROM ENVIRONMENTAL IMPACT INFORMATION DATA BASE (DB) AND COST INFORMATION DATA BASE (DB)

FIG. 12B

OBLON, SPIVAK, ET AL
DOCKET #: 210679US2SRD
INV: Hideki KOBAYASHI, et al.
SHEET 13 OF 30

T06290"h2856860

OBLON, SPIVAK, ET AL
DOCKET #: 210679US2SRD
INV: Hideki KOBAYASHI, et al.
SHEET 14 OF 30

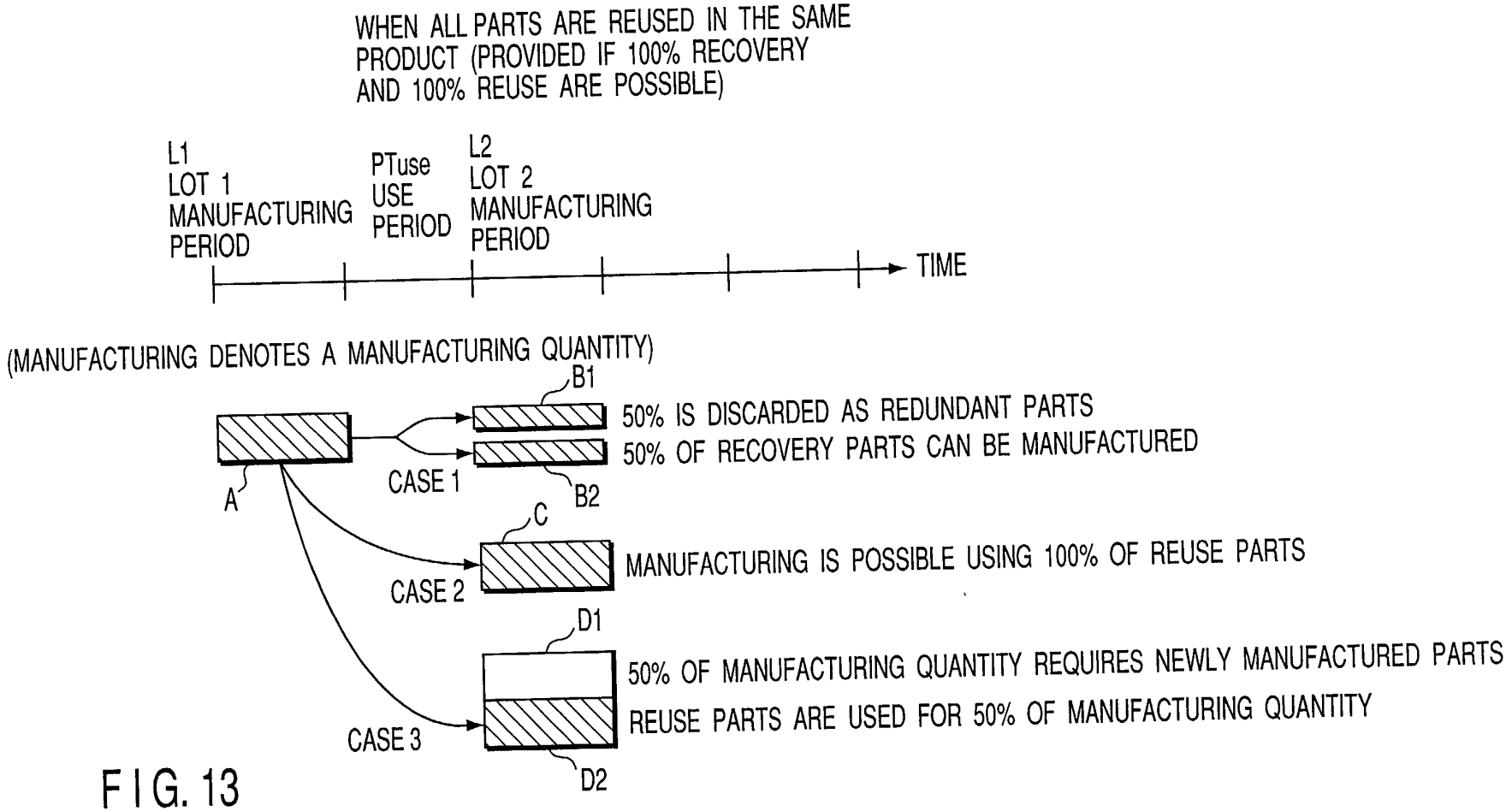

FIG. 13

T06290"h28E6860

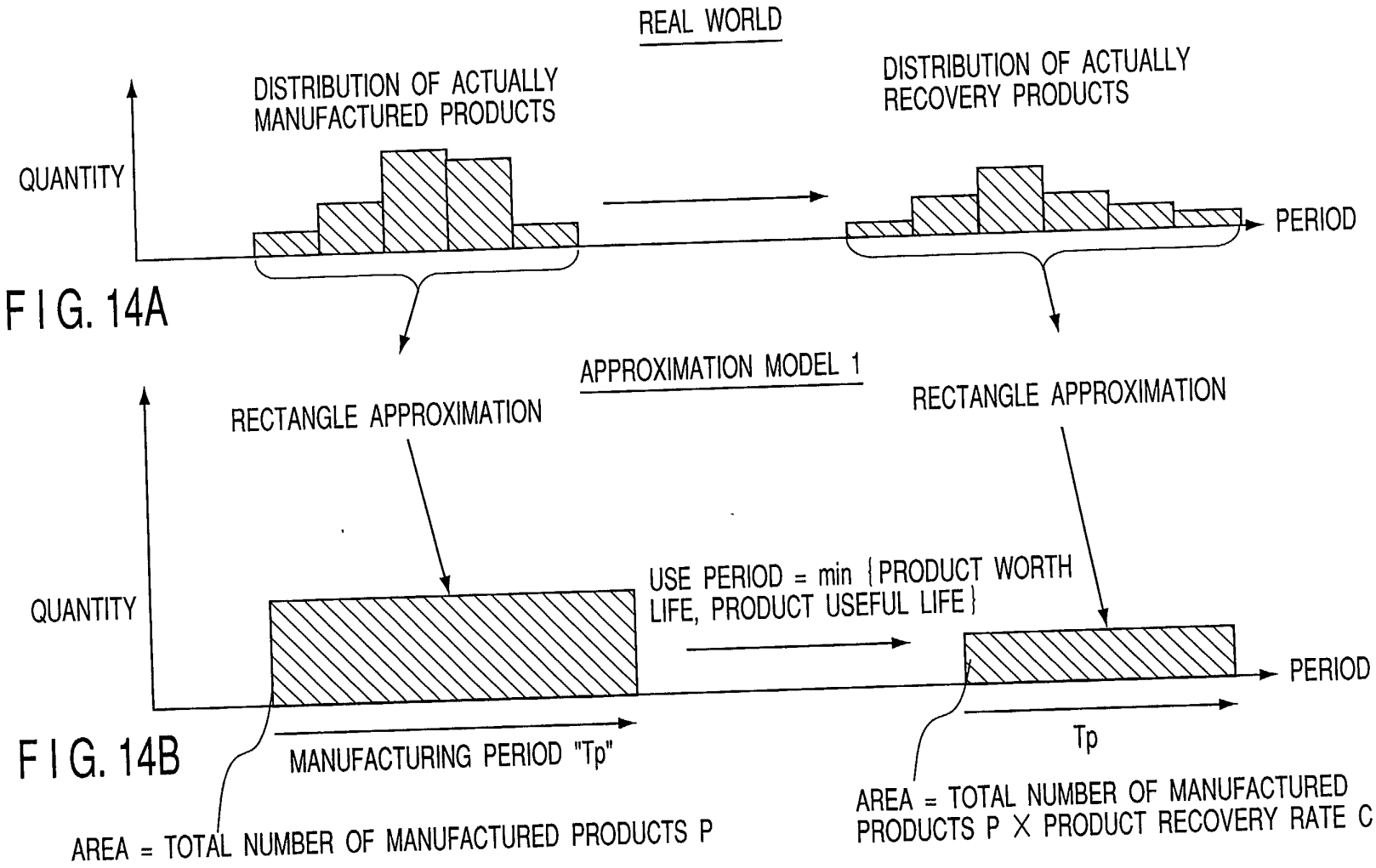

FIG. 14A

FIG. 14B

OBLON, SPIVAK, ET AL
DOCKET #: 210679US2SRD
INV.: Hideki KOBAYASHI, et al.
SHEET 15 OF 30

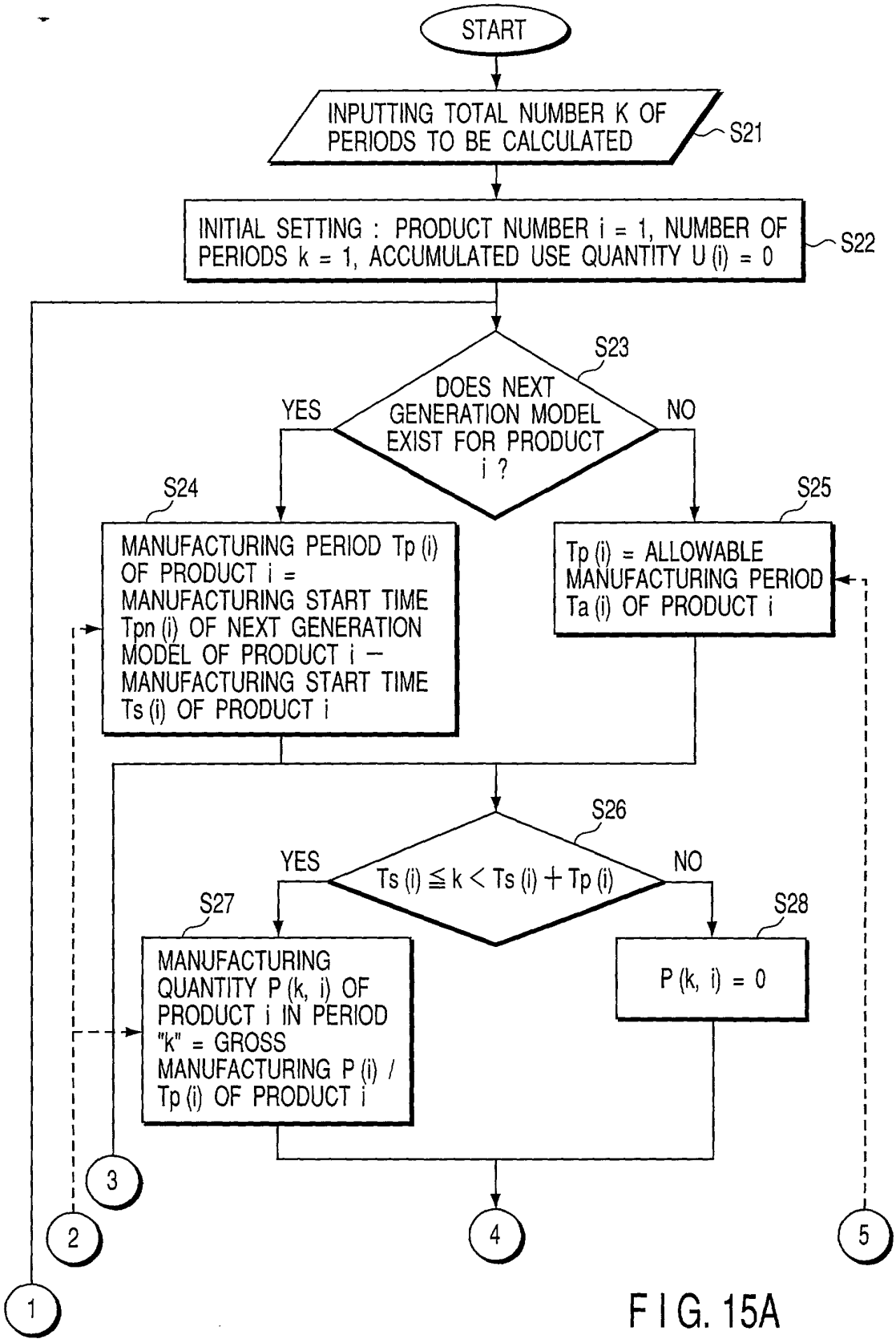
START
INPUTTING TOTAL NUMBER K OF PERIODS TO BE CALCULATED
S21
INITIAL SETTING : PRODUCT NUMBER i = 1, NUMBER OF PERIODS k = 1, ACCUMULATED USE QUANTITY U (i) = 0
S22
S23
DOES NEXT GENERATION MODEL EXIST FOR PRODUCT i ?
YES
NO
S24
MANUFACTURING PERIOD Tp (i) OF PRODUCT i = MANUFACTURING START TIME Tpn (i) OF NEXT GENERATION MODEL OF PRODUCT i − MANUFACTURING START TIME Ts (i) OF PRODUCT i
S25
Tp (i) = ALLOWABLE MANUFACTURING PERIOD Ta (i) OF PRODUCT i
S26
Ts (i) ≦ k < Ts (i) + Tp (i)
YES
NO
S27
MANUFACTURING QUANTITY P (k, i) OF PRODUCT i IN PERIOD "k" = GROSS MANUFACTURING P (i) / Tp (i) OF PRODUCT i
S28
P (k, i) = 0
1
2
3
4
5

FIG. 15A

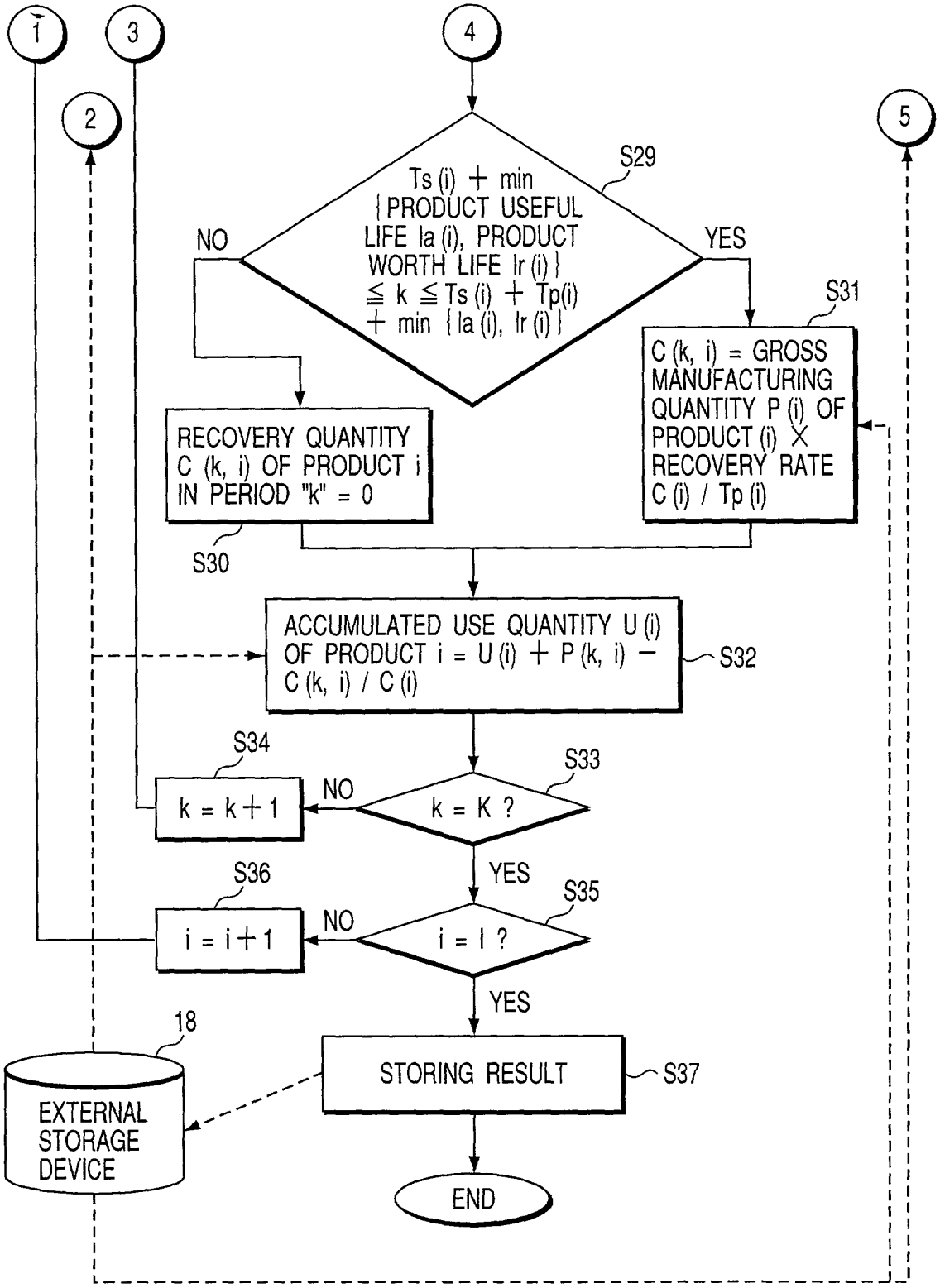
1
3
4
2
5
S29
Ts (i) + min {PRODUCT USEFUL LIFE la (i), PRODUCT WORTH LIFE lr (i)} ≦ k ≦ Ts (i) + Tp(i) + min {la (i), lr (i)}
NO
YES
S31
C (k, i) = GROSS MANUFACTURING QUANTITY P (i) OF PRODUCT (i) X RECOVERY RATE C (i) / Tp (i)
RECOVERY QUANTITY C (k, i) OF PRODUCT i IN PERIOD "k" = 0
S30
ACCUMULATED USE QUANTITY U (i) OF PRODUCT i = U (i) + P (k, i) − C (k, i) / C (i)
S32
S34
k = k+1
NO
S33
k = K ?
YES
S36
i = i+1
NO
S35
i = I ?
YES
18
EXTERNAL STORAGE DEVICE
STORING RESULT
S37
END

FIG. 15B

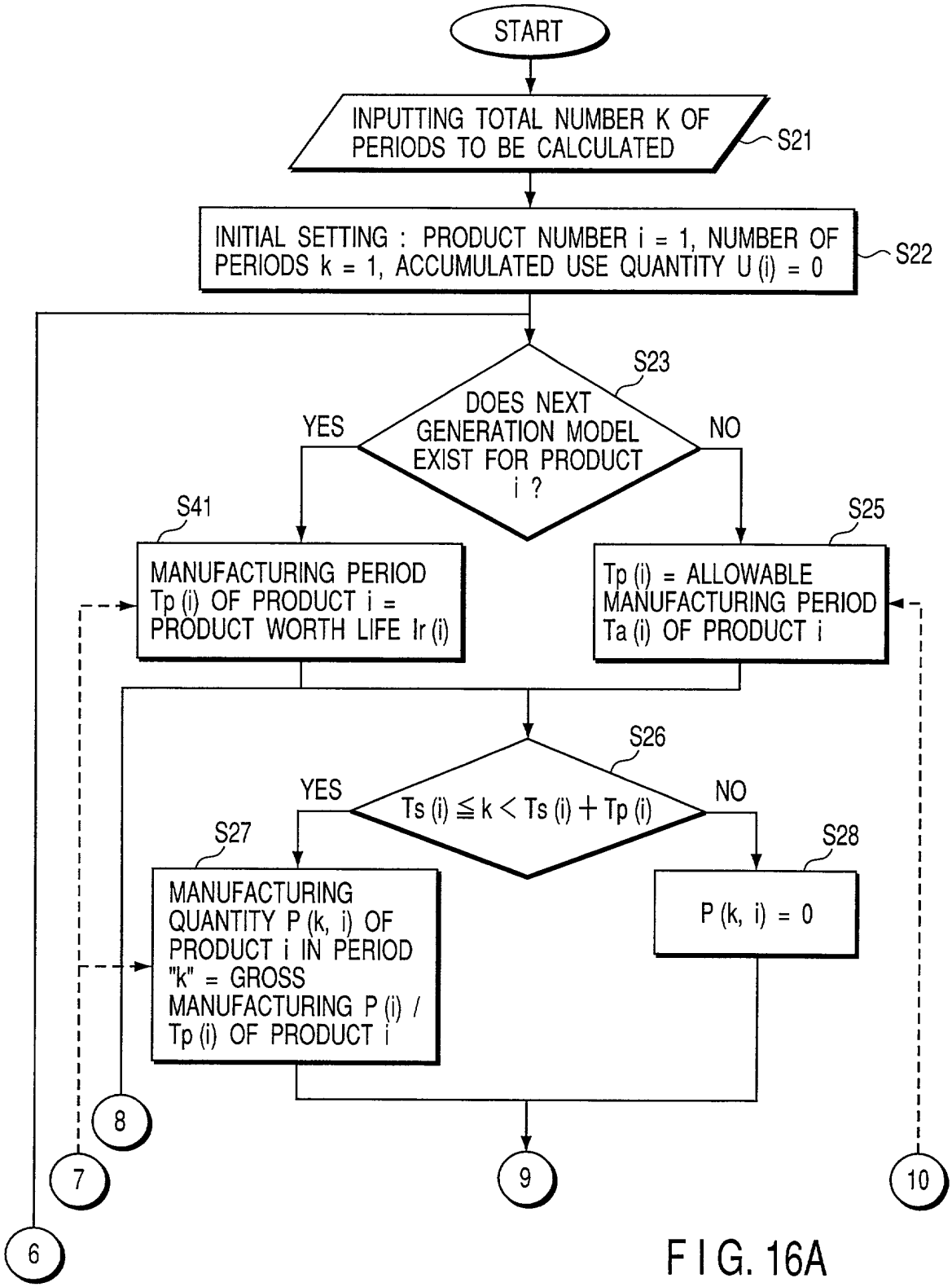
START
INPUTTING TOTAL NUMBER K OF PERIODS TO BE CALCULATED
S21
INITIAL SETTING : PRODUCT NUMBER i = 1, NUMBER OF PERIODS k = 1, ACCUMULATED USE QUANTITY U (i) = 0
S22
S23
DOES NEXT GENERATION MODEL EXIST FOR PRODUCT i ?
YES
NO
S41
MANUFACTURING PERIOD Tp (i) OF PRODUCT i = PRODUCT WORTH LIFE Ir (i)
S25
Tp (i) = ALLOWABLE MANUFACTURING PERIOD Ta (i) OF PRODUCT i
S26
Ts (i) ≦ k < Ts (i) + Tp (i)
YES
NO
S27
MANUFACTURING QUANTITY P (k, i) OF PRODUCT i IN PERIOD "k" = GROSS MANUFACTURING P (i) / Tp (i) OF PRODUCT i
S28
P (k, i) = 0
6
7
8
9
10

FIG. 16A

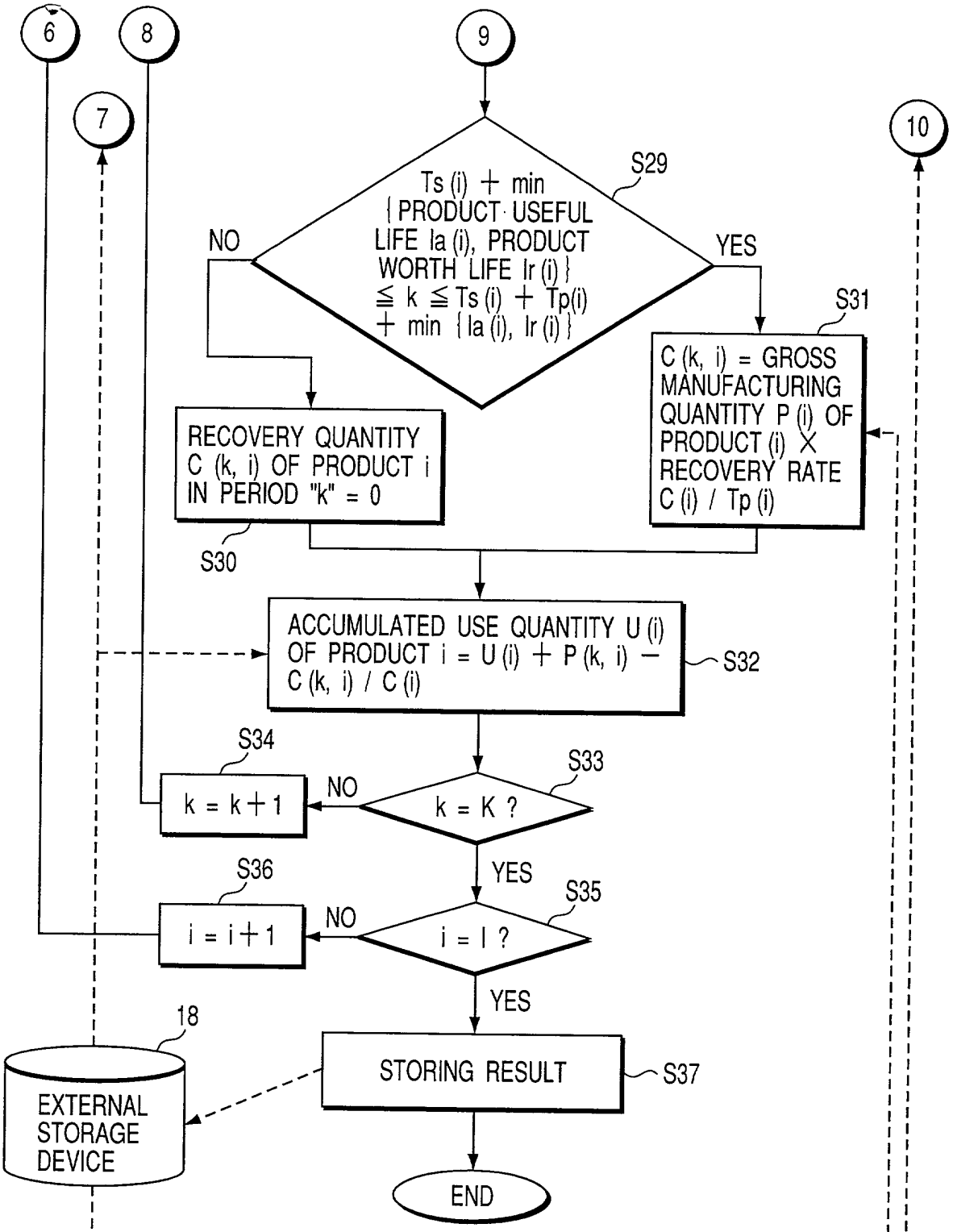
6
8
9
7
10
S29
Ts (i) + min
{ PRODUCT USEFUL LIFE la (i), PRODUCT WORTH LIFE lr (i) }
≦ k ≦ Ts (i) + Tp(i) + min { la (i), lr (i) }
NO
YES
S31
C (k, i) = GROSS MANUFACTURING QUANTITY P (i) OF PRODUCT (i) X RECOVERY RATE C (i) / Tp (i)
RECOVERY QUANTITY C (k, i) OF PRODUCT i IN PERIOD "k" = 0
S30
ACCUMULATED USE QUANTITY U (i) OF PRODUCT i = U (i) + P (k, i) − C (k, i) / C (i)
S32
S34
k = k+1
NO
S33
k = K ?
YES
S36
i = i+1
NO
S35
i = I ?
YES
18
EXTERNAL STORAGE DEVICE
STORING RESULT
S37
END

FIG. 16B

T06290"h28E6860

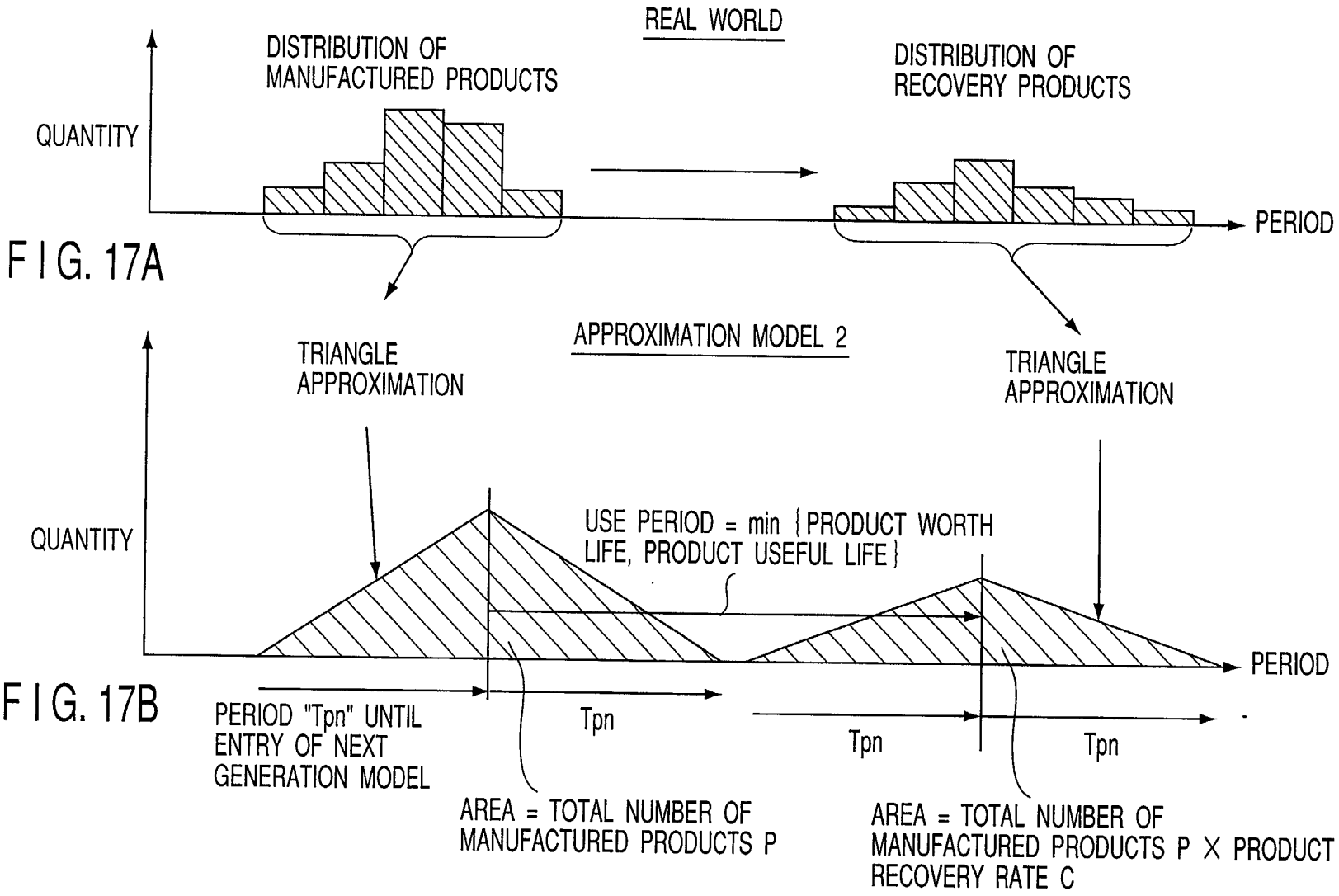

FIG. 17A

FIG. 17B

OBLON, SPIVAK, ET AL
DOCKET #: 210679US2SRD
INV: Hideki KOBAYASHI, et al.
SHEET 20 OF 30

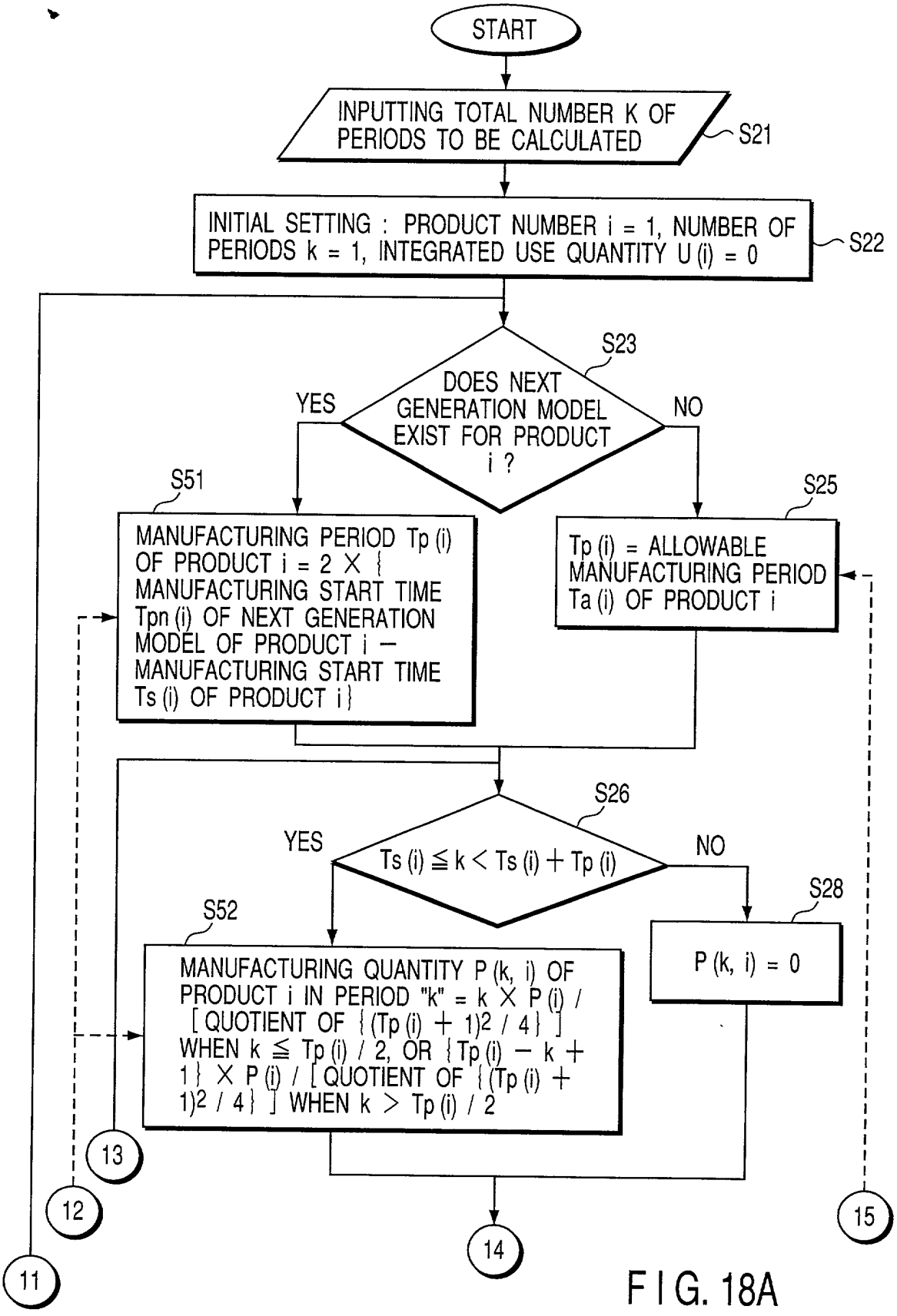
START
INPUTTING TOTAL NUMBER K OF PERIODS TO BE CALCULATED
S21
INITIAL SETTING : PRODUCT NUMBER i = 1, NUMBER OF PERIODS k = 1, INTEGRATED USE QUANTITY U (i) = 0
S22
S23
DOES NEXT GENERATION MODEL EXIST FOR PRODUCT i ?
YES
NO
S51
MANUFACTURING PERIOD Tp (i) OF PRODUCT i = 2 × { MANUFACTURING START TIME Tpn (i) OF NEXT GENERATION MODEL OF PRODUCT i − MANUFACTURING START TIME Ts (i) OF PRODUCT i }
S25
Tp (i) = ALLOWABLE MANUFACTURING PERIOD Ta (i) OF PRODUCT i
S26
Ts (i) ≦ k < Ts (i) + Tp (i)
YES
NO
S52
MANUFACTURING QUANTITY P (k, i) OF PRODUCT i IN PERIOD "k" = k × P (i) / [QUOTIENT OF { (Tp (i) + 1)2 / 4 }] WHEN k ≦ Tp (i) / 2, OR { Tp (i) − k + 1 } × P (i) / [QUOTIENT OF { (Tp (i) + 1)2 / 4 }] WHEN k > Tp (i) / 2
S28
P (k, i) = 0
11
12
13
14
15

FIG. 18A

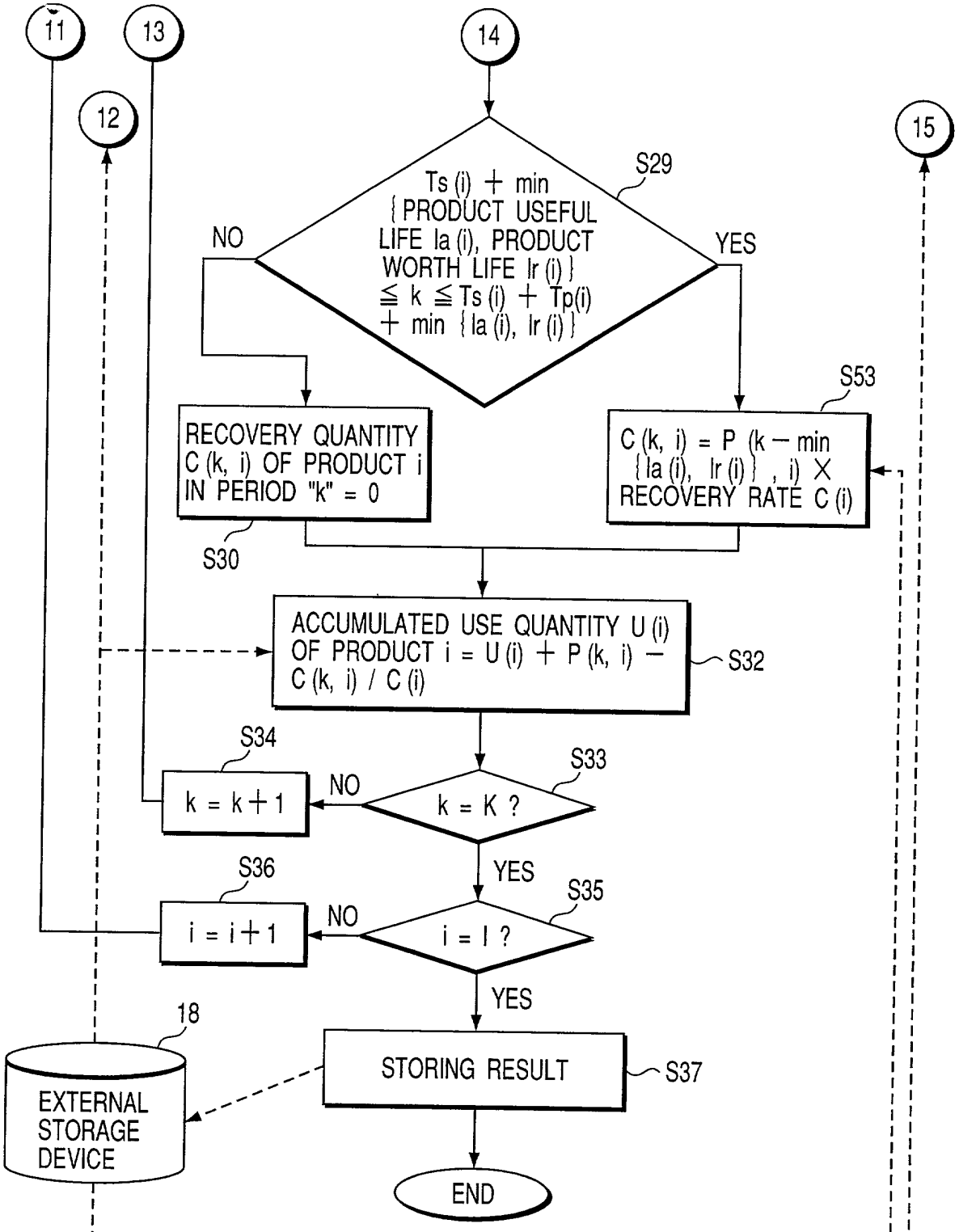
11
13
14
12
15
Ts (i) + min { PRODUCT USEFUL LIFE Ia (i), PRODUCT WORTH LIFE Ir (i) } ≦ k ≦ Ts (i) + Tp(i) + min { Ia (i), Ir (i) }
S29
NO
YES
RECOVERY QUANTITY C (k, i) OF PRODUCT i IN PERIOD "k" = 0
S30
C (k, i) = P (k − min { Ia (i), Ir (i) } , i) × RECOVERY RATE C (i)
S53
ACCUMULATED USE QUANTITY U (i) OF PRODUCT i = U (i) + P (k, i) − C (k, i) / C (i)
S32
S34
k = k + 1
NO
k = K ?
S33
YES
S36
i = i + 1
NO
i = I ?
S35
YES
18
EXTERNAL STORAGE DEVICE
STORING RESULT
S37
END

FIG. 18B

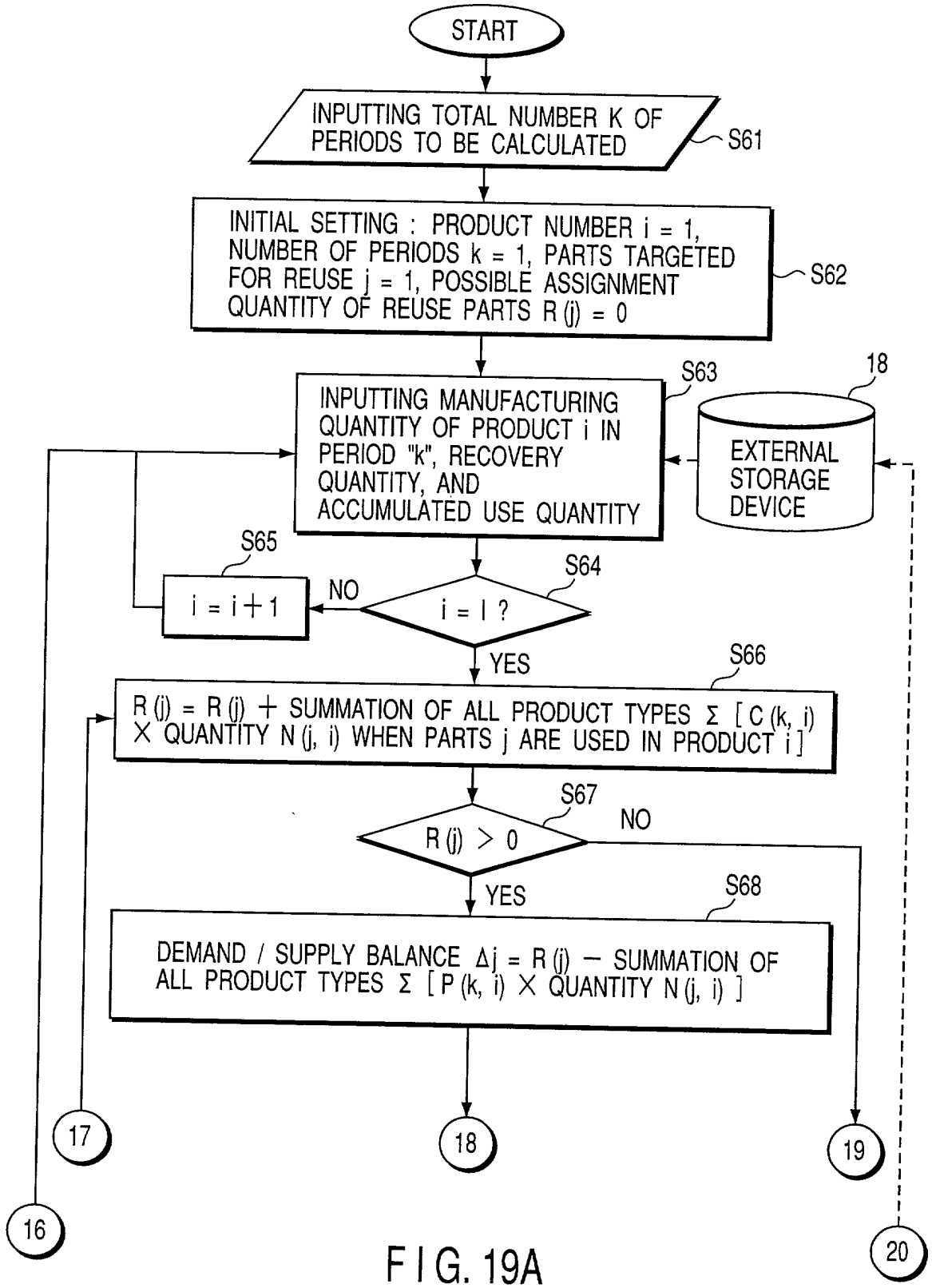
START
INPUTTING TOTAL NUMBER K OF PERIODS TO BE CALCULATED
S61
INITIAL SETTING : PRODUCT NUMBER i = 1, NUMBER OF PERIODS k = 1, PARTS TARGETED FOR REUSE j = 1, POSSIBLE ASSIGNMENT QUANTITY OF REUSE PARTS R (j) = 0
S62
INPUTTING MANUFACTURING QUANTITY OF PRODUCT i IN PERIOD "k", RECOVERY QUANTITY, AND ACCUMULATED USE QUANTITY
S63
18
EXTERNAL STORAGE DEVICE
S65
i = i + 1
NO
S64
i = I ?
YES
S66
R (j) = R (j) + SUMMATION OF ALL PRODUCT TYPES Σ [C (k, i) × QUANTITY N (j, i) WHEN PARTS j ARE USED IN PRODUCT i]
S67
R (j) > 0
NO
YES
S68
DEMAND / SUPPLY BALANCE Δj = R (j) − SUMMATION OF ALL PRODUCT TYPES Σ [P (k, i) × QUANTITY N (j, i)]
16
17
18
19
20

FIG. 19A

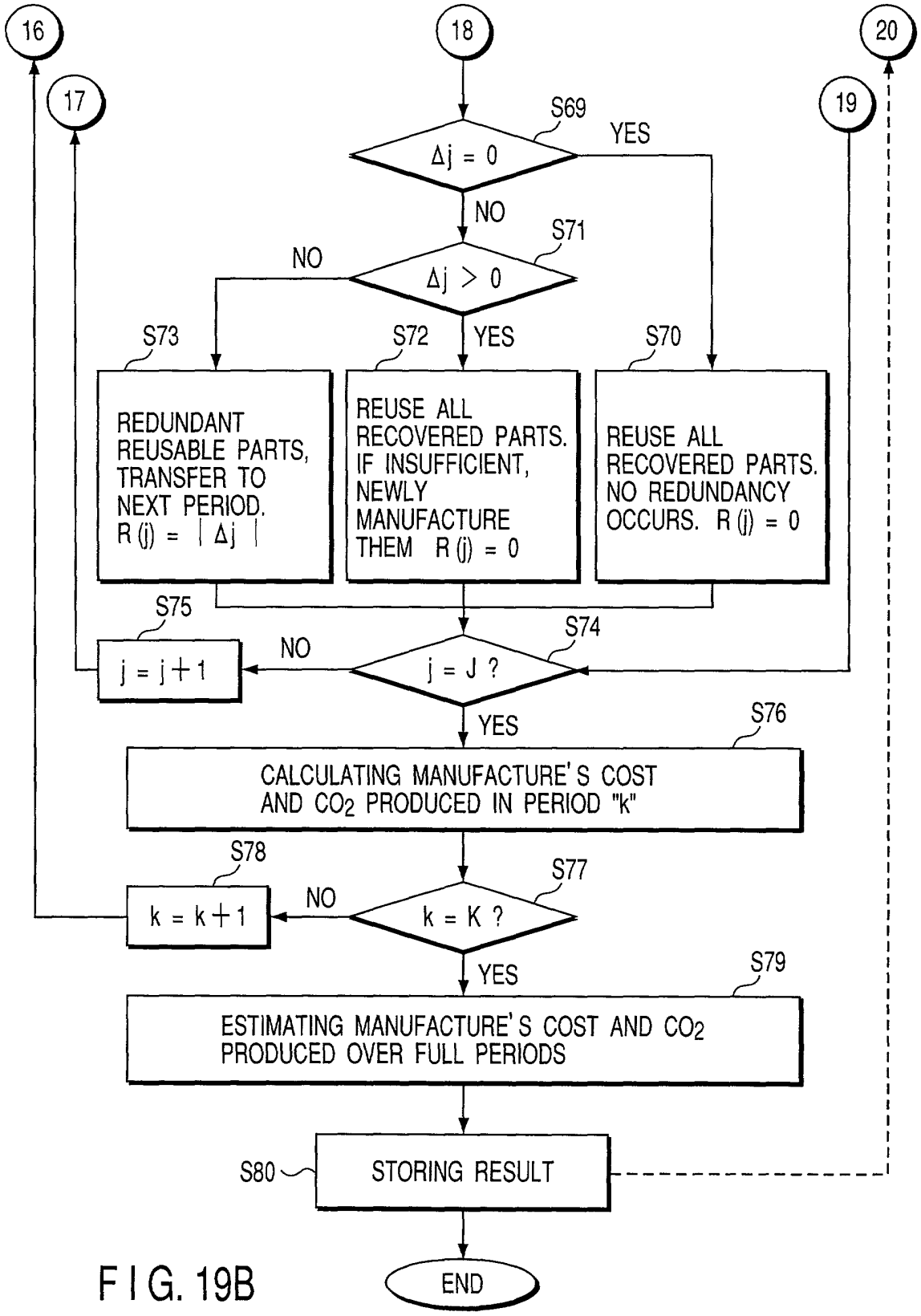
16
17
18
19
20
S69
Δj = 0
YES
NO
S71
NO
Δj > 0
S73
S72
YES
S70
REDUNDANT REUSABLE PARTS, TRANSFER TO NEXT PERIOD. R (j) = | Δj |
REUSE ALL RECOVERED PARTS. IF INSUFFICIENT, NEWLY MANUFACTURE THEM R (j) = 0
REUSE ALL RECOVERED PARTS. NO REDUNDANCY OCCURS. R (j) = 0
S75
j = j + 1
NO
S74
j = J ?
YES
S76
CALCULATING MANUFACTURE'S COST AND CO_2 PRODUCED IN PERIOD "k"
S78
k = k + 1
NO
S77
k = K ?
YES
S79
ESTIMATING MANUFACTURE'S COST AND CO_2 PRODUCED OVER FULL PERIODS
S80
STORING RESULT
END

FIG. 19B

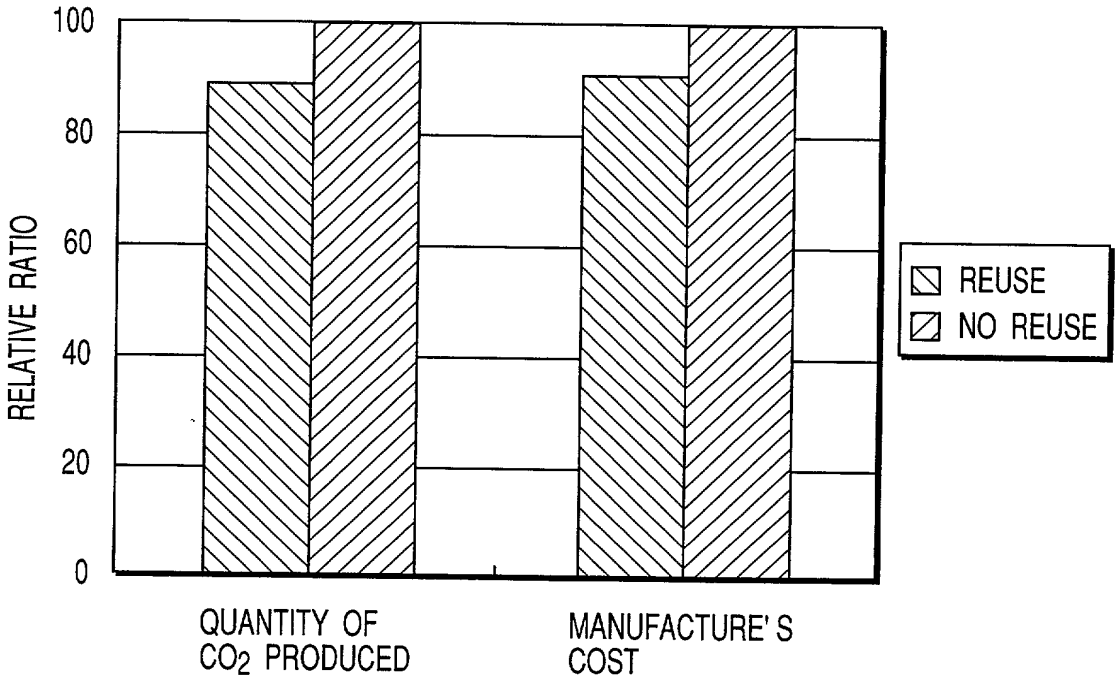
100
80
60
40
20
0
RELATIVE RATIO
REUSE
NO REUSE
QUANTITY OF CO_2 PRODUCED
MANUFACTURE'S COST

FIG. 20

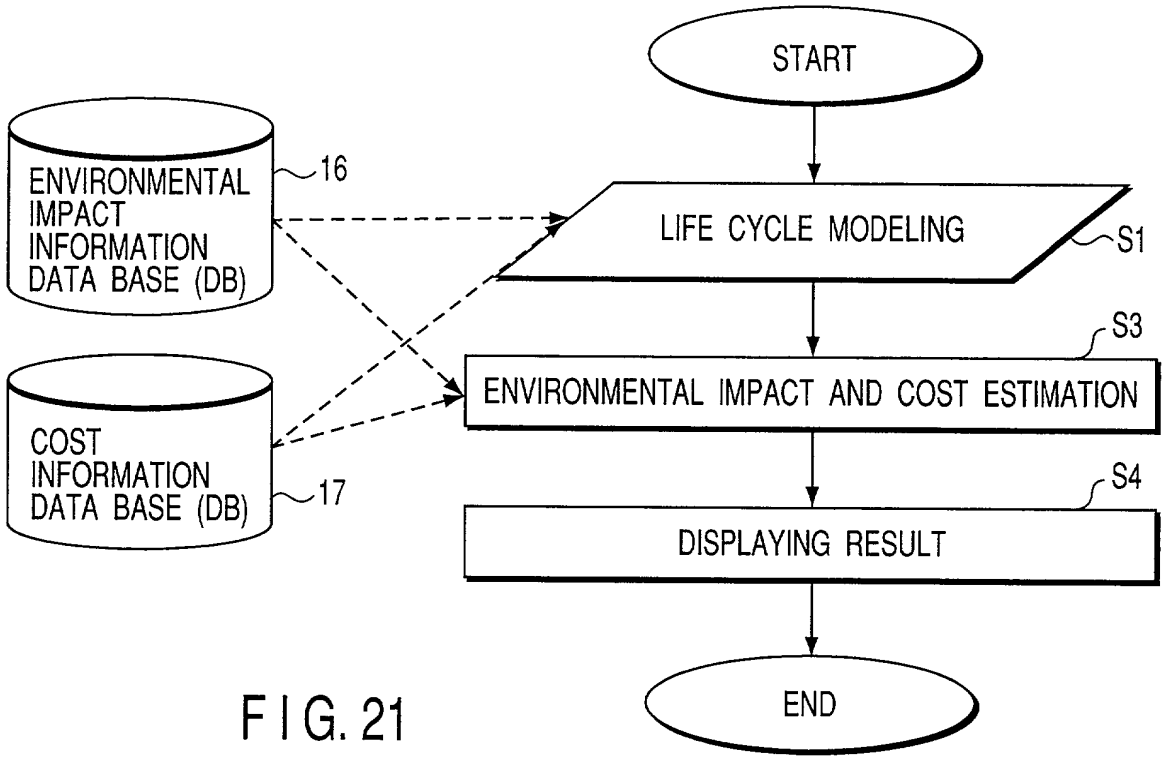
START
ENVIRONMENTAL IMPACT INFORMATION DATA BASE (DB)
16
LIFE CYCLE MODELING
S1
S3
ENVIRONMENTAL IMPACT AND COST ESTIMATION
COST INFORMATION DATA BASE (DB)
17
S4
DISPLAYING RESULT
END

FIG. 21

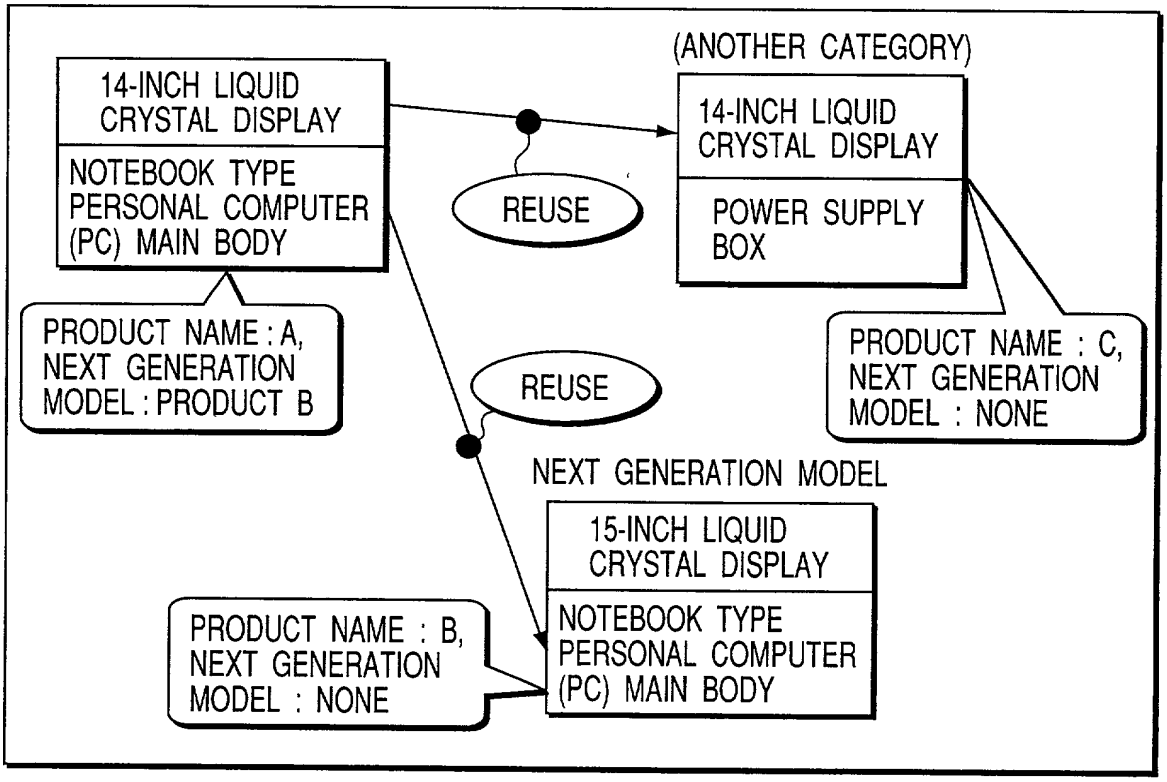
(ANOTHER CATEGORY)
14-INCH LIQUID CRYSTAL DISPLAY
NOTEBOOK TYPE PERSONAL COMPUTER (PC) MAIN BODY
REUSE
14-INCH LIQUID CRYSTAL DISPLAY
POWER SUPPLY BOX
PRODUCT NAME : A, NEXT GENERATION MODEL : PRODUCT B
REUSE
PRODUCT NAME : C, NEXT GENERATION MODEL : NONE
NEXT GENERATION MODEL
15-INCH LIQUID CRYSTAL DISPLAY
NOTEBOOK TYPE PERSONAL COMPUTER (PC) MAIN BODY
PRODUCT NAME : B, NEXT GENERATION MODEL : NONE

FIG. 22

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PRODUCT DATA

PRODUCT NUMBER i	PRODUCT NAME	NEXT GENERATION MODEL NUMBER
1	A	2
2	B	-
3	C	-

PART USE QUANTITY DATA

		PART NUMBER m			
		1	2	3	4
PRODUCT NUMBER i	1	1	1	0	0
	2	0	1	1	0
	3	1	0	0	1

PART DATA

PART NUMBER m	PART NAME	WEIGHT (g)	MATERIAL ACQUISITION CO_2 (g)	PART COST (YEN)	RECOVERY / INSPECTION CO_2 (g)	RECOVERY / INSPECTION COST (YEN)
1	14-INCH LCD	800	3500	20000	100	500
2	NOTEBOOK TYPE PC MAIN BODY	1200	65300	90000	160	800
3	15-INCH LCD	900	3600	40000	100	500
4	POWER SUPPLY BOX	1000	21000	25000	80	400

THESE ITEMS OF DATA ARE SELECTIVELY READ FROM ENVIRONMENTAL IMPACT INFORMATION DATA BASE (DB) AND COST INFORMATION DATA BASE (DB)

FIG. 23A

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REUSE PART DATA

NUMBER j OF PARTS TARGETED FOR REUSE	REUSE SOURCE MANUFACTURING NUMBER i	REUSE DESTINATION MANUFACTURING NUMBER i
1	1	3
2	1	2

PART NUMBER m	NUMBER j OF PARTS TARGETED PARTS
1	1
2	2
3	-
4	-

COMMON DATA

CO_2 PRODUCED PER PRODUCT MANUFACTURE (g)	COST PER PRODUCT (YEN)
3200	200

CO_2 PRODUCED PER PRODUCT DISTRIBUTION (g)	COST PER PRODUCT (YEN)
15	2000

CO_2 PRODUCED PER YEAR (g)	COST PER YEAR (YEN)
850	3000

CO_2 PRODUCED PER UNIT WEIGHT RECOVERY (g)	COST PER UNIT WEIGHT
0.1	1

CO_2 PRODUCED PER UNIT WEIGHT DISCARDING (g)	COST PER UNIT WEIGHT
0.8	0.5

THESE ITEMS OF DATA ARE SELECTIVELY READ FROM ENVIRONMENTAL IMPACT INFORMATION DATA BASE (DB) AND COST INFORMATION DATA BASE (DB)

FIG. 23B

OBLON, SPIVAK, ET AL
DOCKET #: 210679US2SRD
INV: Hideki KOBAYASHI, et al.
SHEET 28 OF 30

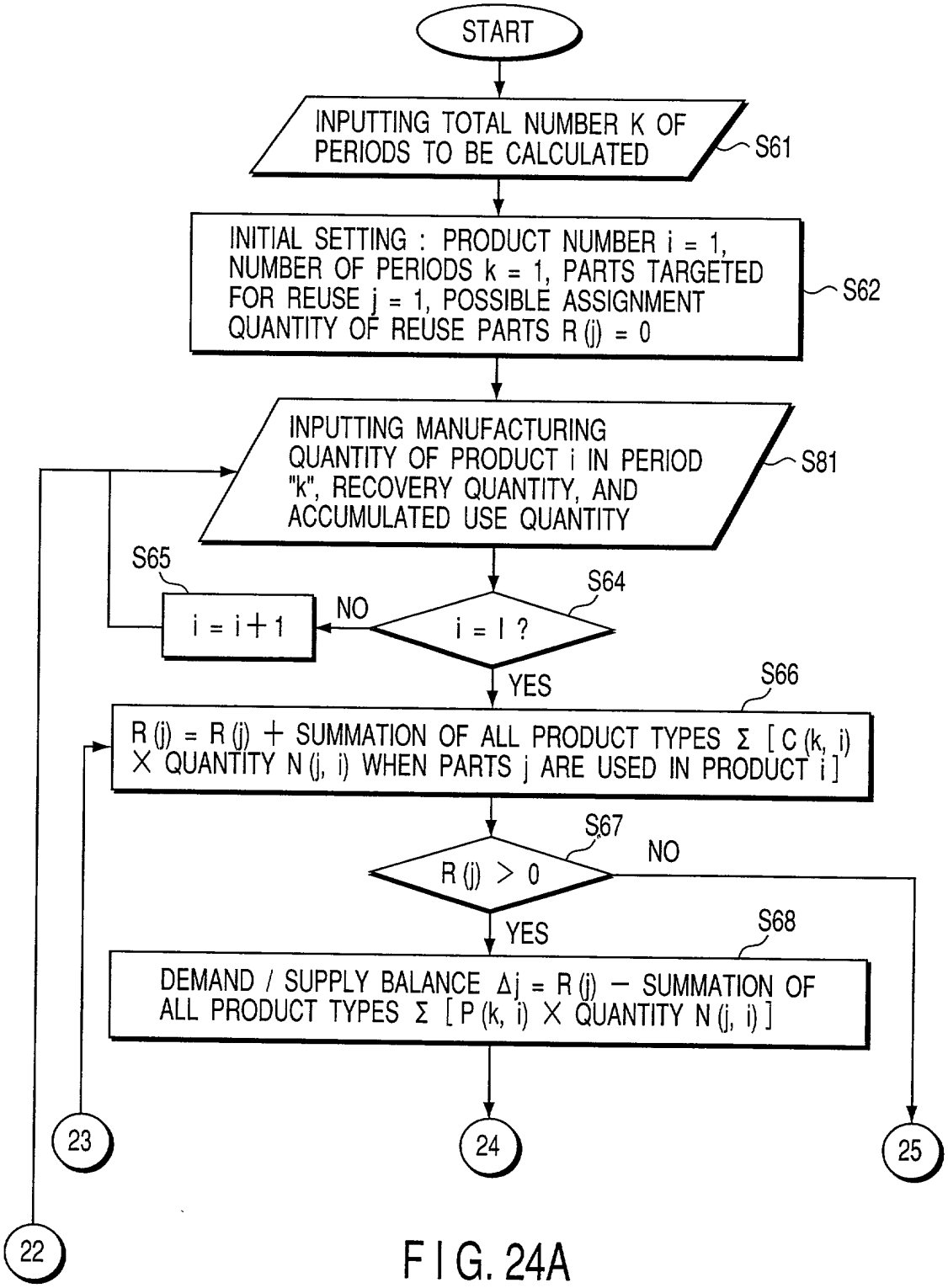
START
INPUTTING TOTAL NUMBER K OF PERIODS TO BE CALCULATED
S61
INITIAL SETTING : PRODUCT NUMBER i = 1, NUMBER OF PERIODS k = 1, PARTS TARGETED FOR REUSE j = 1, POSSIBLE ASSIGNMENT QUANTITY OF REUSE PARTS R (j) = 0
S62
INPUTTING MANUFACTURING QUANTITY OF PRODUCT i IN PERIOD "k", RECOVERY QUANTITY, AND ACCUMULATED USE QUANTITY
S81
S65
i = i + 1
NO
S64
i = I ?
YES
S66
R (j) = R (j) + SUMMATION OF ALL PRODUCT TYPES Σ [C (k, i) × QUANTITY N (j, i) WHEN PARTS j ARE USED IN PRODUCT i]
S67
R (j) > 0
NO
YES
S68
DEMAND / SUPPLY BALANCE Δj = R (j) − SUMMATION OF ALL PRODUCT TYPES Σ [P (k, i) × QUANTITY N (j, i)]
23
24
25
22

FIG. 24A

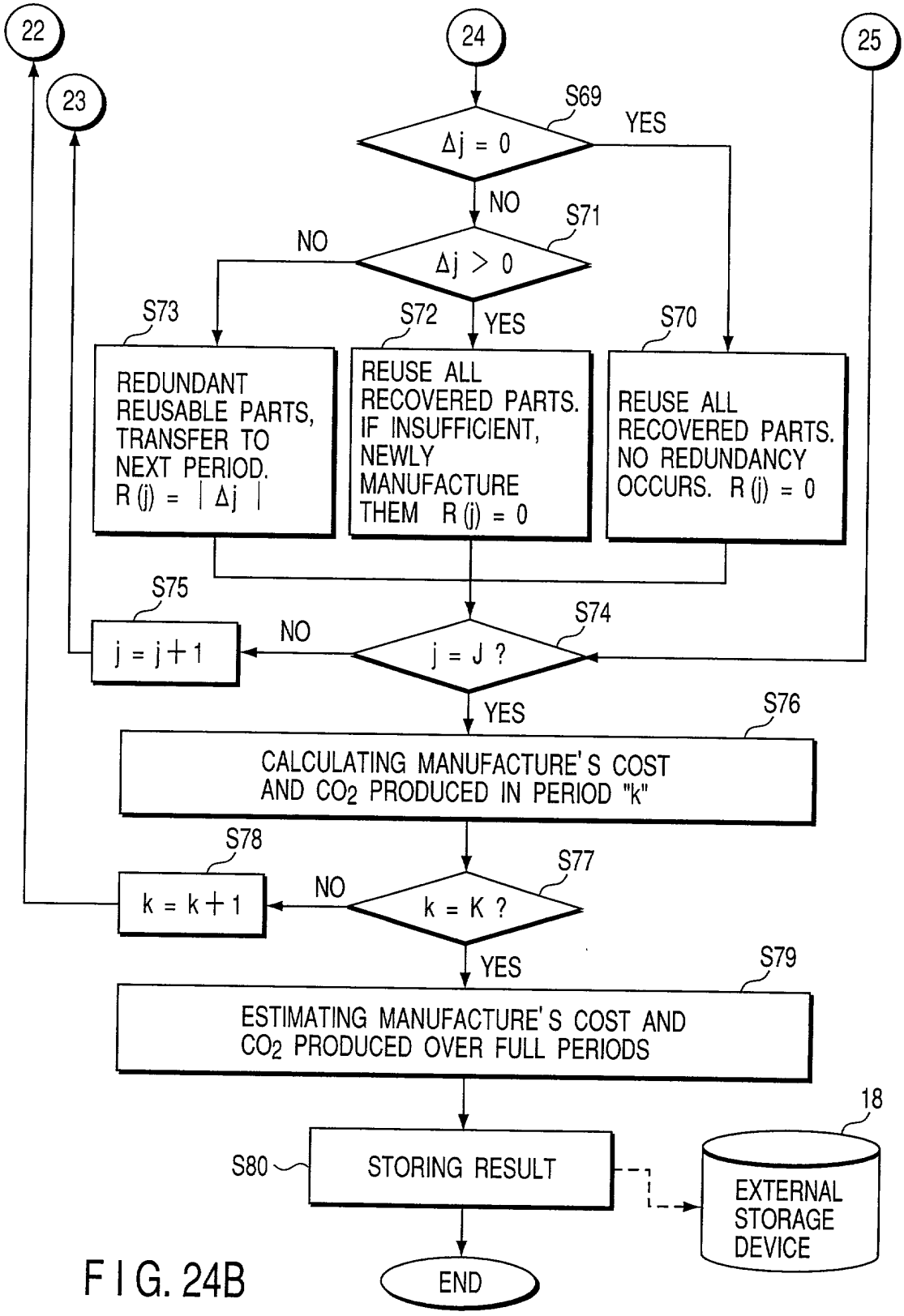
22
23
24
25
S69
Δj = 0
YES
NO
S71
Δj > 0
NO
YES
S73
S72
S70
REDUNDANT REUSABLE PARTS, TRANSFER TO NEXT PERIOD. R (j) = | Δj |
REUSE ALL RECOVERED PARTS. IF INSUFFICIENT, NEWLY MANUFACTURE THEM R (j) = 0
REUSE ALL RECOVERED PARTS. NO REDUNDANCY OCCURS. R (j) = 0
S75
j = j + 1
NO
S74
j = J ?
YES
S76
CALCULATING MANUFACTURE'S COST AND CO_2 PRODUCED IN PERIOD "k"
S78
k = k + 1
NO
S77
k = K ?
YES
S79
ESTIMATING MANUFACTURE'S COST AND CO_2 PRODUCED OVER FULL PERIODS
18
S80
STORING RESULT
EXTERNAL STORAGE DEVICE
END

FIG. 24B